McKinsey Global Institute

December 2013

Reverse the curse: Maximizing the potential of resource-driven economies

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Preface

Investment in oil and gas, and minerals will need to increase significantly to 2030 to meet strong demand (particularly in emerging markets) and replace existing sources of supply coming to the end of their useful lives. This investment should promise huge benefits to countries with major reserves of natural resources. However, all too often, governments in these countries have failed to make the most of their potential resource wealth.

In 2011, the McKinsey Global Institute (MGI), together with McKinsey's Sustainability & Resource Productivity Practice (SRP), published a report entitled *Resource Revolution: Meeting the world's energy, materials, food, and water needs*. We highlighted the fact that the world is in the throes of a fundamental shift in the resource landscape. The unprecedented pace and scale of economic development in emerging markets means demand for resources is surging, and prices for most resources have risen sharply since the turn of the century. Our most recent MGI resource-related research, in September of this year—*Resource Revolution: Tracking global commodity markets*—highlighted the fact that, despite declines in some resource prices over the past two years, on average commodity prices have more than doubled since 2000. Even with a step change in resource productivity—the efficiency with which we develop, extract, and use resources—significant additional supply of resources will be needed to support economic growth.

This report—*Reverse the curse: Maximizing the potential of resource-driven economies*—builds on this past work by taking a closer look at how the world's rising need for resources can be met, and, in particular, how countries that have large resource endowments can handle them more effectively in order to bolster economic development. Our latest research is a joint effort of MGI, SRP, and McKinsey's Global Energy & Materials Practice (GEM). It aims to offer new insights on how the supply landscape is evolving in oil and gas and minerals, and the potential opportunity for resource-driven economies. It discusses how policy makers in these countries will need to adopt new approaches to ensure that their resource endowments are a blessing for their economies rather than a curse as they have proved all too often in the past. The report considers issues ranging from local content to shared infrastructure and economic diversification. It also examines the strategic implications for extractive companies and argues that they, like governments, will need to adopt a new approach if they are to reap the full benefit of new resource reserves that could come online in the years ahead.

The research was directed by Richard Dobbs, director of McKinsey and MGI; Jeremy Oppenheim, leader of SRP; Adam Kendall, a partner in the McKinsey sub-Saharan office; Pablo Ordorica Lenero, leader of SRP in Latin America; and Harry Robinson, a GEM leader. Fraser Thompson, an MGI senior fellow based in London, led the research, with help from Martin Bratt, an associate principal also in London. Fransje van der Marel led the project team of Nicolo Andreula, S. Aparajida, Byron Ascott-Evans, Soumiya Balasubramanian, Greg Callaway, Markus Gstöttner, Cecile Lavrard, Tim McEvoy, Angel Sarmiento, Sahil Shekhar, and Lee Teslik. We would like to thank Caitlin McElroy from the Oxford Smith School of Enterprise and the Environment for her input to the team.

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Many experts in academia, government, and industry have offered invaluable guidance, suggestions, and advice. Our particular thanks to MGI advisers Martin Baily, Bernard L. Schwartz Chair in Economic Policy Development at the Brookings Institution; Richard Cooper, Maurits C. Boas Professor of International Economics at Harvard University; Paul Collier, professor of economics and public policy at the Blavatnik School of Government and co-director of the Centre for the Study of African Economies at the University of Oxford; and Lars Thunell, former Executive Vice President and CEO of the International Finance Corporation (IFC) and current non-executive director of Standard Chartered and Kosmos Energy.

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As with all MGI research, we would like to emphasize that this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution.

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The challenge …

81 countries driven by resources in 2011 accounting for 26 percent of global GDP, up from 58 generating only 18 percent of world GDP in 1995

69% of people in extreme poverty are in resource-driven countries

Almost **80%** of countries whose economies have historically been driven by resources have per capita income levels below the global average, and more than **½** of these are not catching up

Almost **90%** of resources investment has historically been in upper-middle-income and high-income countries

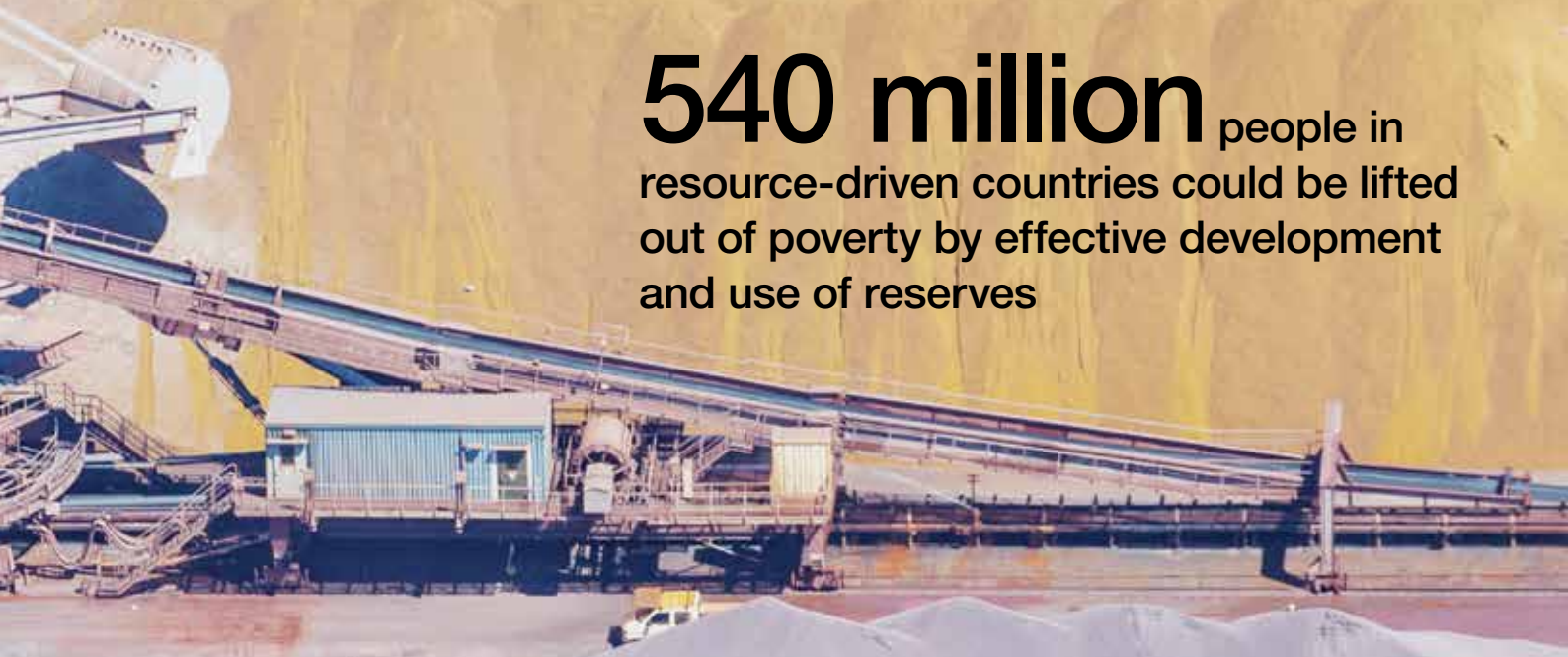
NOTE: We define “resource-driven countries” as those economies where the oil, gas, and mineral sectors play a dominant role, using three criteria: (1) resources account for more than 20 percent of exports; (2) resources generate more than 20 percent of fiscal revenue; or (3) resource rents are more than 10 percent of economic output.

… and the opportunity

~½ of the world's known mineral and oil and gas reserves are in non-OECD, non-OPEC countries

Up to **$17 trillion** of cumulative investment in oil and gas, and mineral resources could be needed by 2030—more than double the historical rate of investment

540 million people in resource-driven countries could be lifted out of poverty by effective development and use of reserves



Opportunities to share much of the **$2 trillion** of cumulative investment in resource infrastructure in resource-driven countries to 2030

50%+ improvement in resource-sector competitiveness possible through joint government and industry action

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Executive summary

The historical rate of investment in oil and gas and minerals may need to more than double to 2030 to replace existing sources of supply that are coming to the end of their useful lives and to meet strong demand from huge numbers of new consumers around the world, particularly in emerging economies. If resource-driven countries, particularly those with low average incomes, use their resources sectors as a platform for broader economic development, this could transform their prospects.[1] We estimate that they could lift almost half the world's poor out of poverty—more than the number that have left the ranks of the poor as the result of China's rapid economic development over the past 20 years.

However, many resource-driven countries have failed to convert their resource endowments into long-term prosperity. Almost 80 percent of these countries have per capita income below the global average, and since 1995, more than half of these countries have failed to match the average growth rate (of all countries). Even fewer have translated growth into broad-based prosperity. On average, resource-driven countries score almost one-quarter lower than other countries on the MGI Economic Performance Index. In addition, only one-third of them have been able to maintain growth beyond the boom.

Resource-driven countries need a new growth model to transform the potential resource windfall into long-term prosperity. In this report, we lay out such a model, drawing on the many successful approaches that some resource-driven countries have employed. It has six core elements: building the institutions and governance of the resources sector; developing infrastructure; ensuring robust fiscal policy and competitiveness; supporting local content; deciding how to spend a resources windfall wisely; and transforming resource wealth into broader economic development.

Extractive companies also need a new approach to the changing resource landscape. Their relationships with governments in the countries where they operate have often been colored by tension. Governments are under pressure from citizens to reap a greater share of the rewards of developing their natural resources; extractive companies are often uncertain whether governments might withdraw their licenses or renegotiate their contracts. As exploration and production increasingly shift to developing countries and frontier markets, companies that can reframe their mission from simple extraction to ongoing partnership with host governments in economic development are likely to secure a real competitive advantage. This report offers a set of tools and approaches for achieving this relationship.

1 We define "resource-driven countries" as those economies where the oil, gas, and mineral sectors play a dominant role, using three criteria: (1) resources account for more than 20 percent of exports; (2) resources generate more than 20 percent of fiscal revenue; or (3) resource rents are more than 10 percent of economic output. We also include countries that do not currently meet these criteria but who are expected to meet them in the near future. See the appendix for more detail.

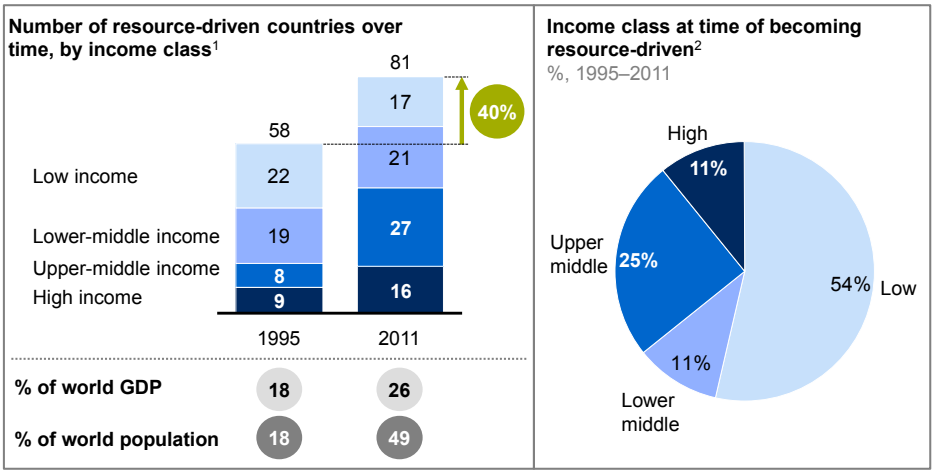
Our work builds on a substantial body of past analysis but explicitly acknowledges that resource-driven countries are at different stages of their economic development. We aim to give policy makers and extractive companies concrete and practical information to guide their approaches.

Investment of between $11 trillion and $17 trillion could transform resource-driven countries

As a result of generally rising resource prices and the expansion of production into new geographies, the number of countries in which the resources sector represents a major share of their economy has increased significantly. In 1995, there were 58 resource-driven economies that collectively accounted for 18 percent of global economic output. By 2011, there were 81 such countries, accounting for 26 percent of global economic output (Exhibit E1).

Exhibit E1

The number of resource-driven countries has increased by more than 40 percent since 1995, and most new ones have low average incomes



1 We define resource-driven countries using three criteria: (1) resources are more than 20 percent of exports; (2) resources are more than 20 percent of fiscal revenue; or (3) resource rents are more than 10 percent of GDP. Where data were not available, we estimated based on the nearest year's data.

2 World Bank income classifications based on per capita gross national income (GNI) by country; thresholds updated annually. In 2011, the World Bank thresholds for categorization were $1,026 for lower-middle income, $4,036 for upper-middle income, and $12,476 for high income.

NOTE: Numbers may not sum due to rounding.

SOURCE: UNCTADstat; International Monetary Fund; World Bank; IHS Global Insight; McKinsey Global Institute analysis

Many of these new resource-driven countries have very low incomes. Of the countries that have become resource-driven since 1995, more than half were defined as "low income" by the World Bank when they became resource-driven.[2] The increasing number of economies that rely on natural resources underlines how important it is for their governments to manage their resources wisely and to cultivate sound and productive relationships with extractive companies.

There is, of course, no certainty about the future direction resource prices will take and how these trends will affect growth in resource-driven economies. However, the following factors should be considered:

- **The unprecedented scale of new demand.** More than 1.8 billion people will join the ranks of the world's consuming class by 2025.[3] The growth of India and China is historically unprecedented: it is happening at about ten times the speed at which the United Kingdom improved average incomes during the Industrial Revolution and on around 200 times the scale. The new demand caused by this consuming class is huge. If we look only at cars, for example, we expect the global car fleet to double to 1.7 billion by 2030. Demand from the new consuming classes will also trigger a dramatic expansion in global urban infrastructure, particularly in developing economies. Every year, China could add floor space totaling 2.5 times the entire residential and commercial square footage of the city of Chicago. India could add floor space equal to another Chicago annually.

- **The need for new sources of supply.** Historically, much of the existing supply of resources has come from the Organisation for Economic Co-operation and Development (OECD) group of developed economies, but many of these resources are nearing depletion. Previous MGI research estimated that, in the absence of significant productivity improvements, the supply of energy and steel would have to increase at a rate 30 to 60 percent higher than the rate in the past 20 years.[4] Almost three-quarters of that supply in the case of energy is necessary to replace existing sources that are coming to the end of their useful lives. Peter Voser, chief executive officer of Shell, stated in 2011 that the equivalent of "four Saudi Arabias or ten North Seas over the next ten years" needs to be added just to replace declining production and to keep oil output flat.[5] Even if the world were able to achieve a step change in resource productivity—the efficiency with which resources are extracted and used—new sources would still be required to replace those that are running out.

2 World Bank income classifications are based on per capita gross national income. Thresholds are updated annually. In 2011, the World Bank's income thresholds were: low income, $1,025 or less; lower-middle income, $1,026–$4,035; upper-middle income, $4,036–$12,475; and high income, $12,476 or more.

3 We define members of the consuming class as those with daily disposable income of more than $10 (adjusted for purchasing power parity) and draw on the McKinsey Global Institute Cityscope 2.0 database.

4 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

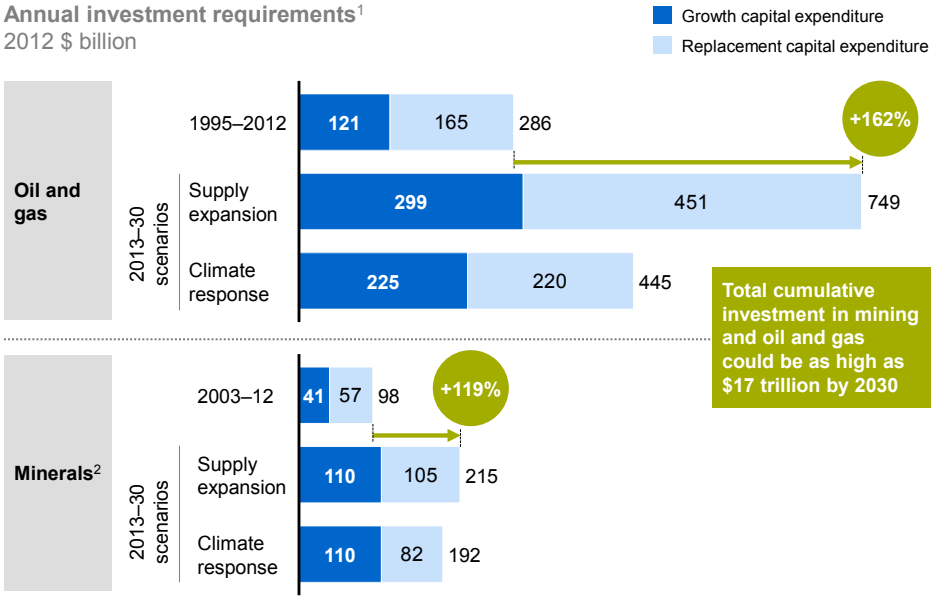
5 "Rush is on to develop smarter power," *Financial Times* Special Report, September 29, 2011.

High levels of new investment will be needed to meet demand for resources and replace existing sources of supply. Even if we assume a significant improvement in resource productivity and shifts in the primary energy mix consistent with achieving a 450-ppm carbon pathway, MGI estimates that $11 trillion to $17 trillion will need to be invested in oil and gas, and minerals extraction by 2030.[6] This is 65 to 150 percent higher than historical investment over an equivalent period (Exhibit E2).

Exhibit E2

Investment in oil and gas and minerals may need to increase at more than double historical rates to meet new demand and replace existing supply

Annual investment requirements[1]
2012 $ billion



1 See the appendix for further details on the methodology.
2 Includes iron ore, coal, copper, and an estimate for other mineral resources.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Energy Insights; McKinsey Basic Materials Institute; Wood Mackenzie; Rystad Energy; IHS Global Insight; World Bank; McKinsey Global Institute analysis

Historically, almost 90 percent of that investment has been in high-income and upper-middle-income countries. But in the future, the share of resource investment outside these two groups—to low-income and lower-middle-income countries—could almost double. Almost half of the world's known mineral and oil and gas reserves are in countries that are not members of the OECD or the Organization of the Petroleum Exporting Countries (OPEC).

This undoubtedly understates the true potential for resource production in the developing world, given that relatively little exploration has taken place in these countries. For example, there is an estimated $130,000 of known sub-soil assets beneath the average square kilometer of countries in the OECD.[7] In contrast, only around $25,000 of known sub-soil assets lie beneath the average square kilometer of Africa, a continent that relies heavily on exports of natural resources. This huge disparity does not reflect fundamental differences in geology. It is likely

6 A 450-ppm pathway describes a long-term stabilization of emissions at 450-ppm carbon dioxide equivalent, which is estimated by the Intergovernmental Panel on Climate Change (IPCC) to have a 40 to 60 percent chance of containing global warming below the 2° C threshold by the end of the 21st century.

7 Paul Collier, *The plundered planet: Why we must—and how we can—manage nature for global prosperity*, Oxford University Press, 2011.

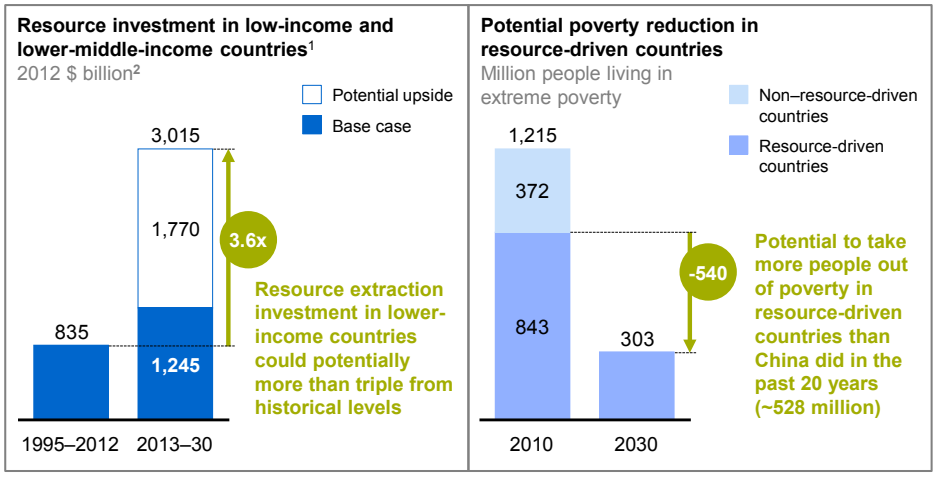
that Africa has more, not fewer, assets than advanced economies that have been extracting resources for two centuries. But to date, there has been only limited international investment in exploration and prospecting in Africa. Much of that continent's resources still await discovery.

If governments in low-income and lower-middle-income countries use their endowments wisely and develop effective collaboration with extraction companies, they can potentially transform their economies and the lives of their citizens. How large could the prize be? Based on a range of methodologies, including estimates from industry experts, announced projects, and equalization of investment per square kilometer (excluding OPEC countries), cumulative investment of between $1.2 trillion and $3 trillion is possible in low-income and lower-middle-income countries by 2030 out of the worldwide total of $11 trillion to $17 trillion. In the high case, this would be almost $170 billion a year, more than three times development aid flows to these countries in 2011.

If all resource-driven countries were to match the average historical rate of poverty reduction of the best performers in this group, there is potential to lift 540 million people out of poverty by 2030 overall (Exhibit E3).[8] This is more than the number of people that China managed to shift out of poverty over the past two decades.

Exhibit E3

Investment in resource extraction could trigger economic and social transformation in lower-income countries over the next two decades



1 As defined by the World Bank on the basis of per capita GNI in 2011. Investment includes oil and gas and minerals.
2 This represents the share of the total global cumulative investment to 2030 (up to $17 trillion in total) that could be focused on low-income and lower-middle-income countries. See the appendix for further details on the methodology.
NOTE: We have not shown poverty statistics for non–resource-driven countries to 2030.
SOURCE: McKinsey Energy Insights; McKinsey Basic Materials Institute; Wood Mackenzie; Rystad Energy; IHS Global Insight; World Bank; McKinsey Global Institute analysis

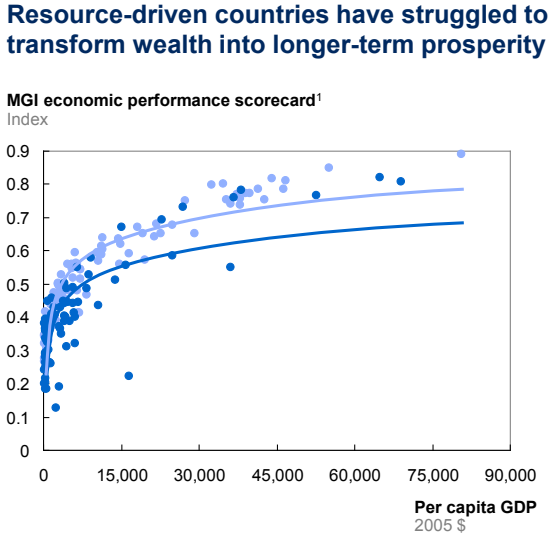
8 Further details on the methodology can be found in the appendix.

THE 20TH-CENTURY RESOURCE-DEVELOPMENT MODEL WON'T DELIVER THIS POTENTIAL

The windfall from natural resources represents a large opportunity for developing countries, but there is no guarantee they will be able to seize it and achieve sustainable, broad-based prosperity using resources as a platform. Although it is difficult to compare the economic performance of resource-driven countries due to limited data and the lack of a suitable control group, available evidence suggests that they have tended to underperform economies that do not rely on resources to the same extent. Almost 80 percent of resource-driven countries have below-average levels of per capita income. Since 1995, more than half of these countries have failed to match the global average (unweighted) per capita growth rate. Even when resource-driven economies manage to sustain above-average economic growth over the long term, they do not necessarily enhance prosperity in the broader sense, as measured by MGI's economic performance scorecard.[9] On average, resource-driven countries score almost one-quarter less than countries that are not driven by their resources, even at similar levels of per capita GDP (Exhibit E4). In Zambia, for example, poverty levels increased from 2002 to 2010 despite strong economic growth.[10]

Exhibit E4

Resource-driven countries have struggled to transform wealth into longer-term prosperity



Average economic performance score by income bracket
$ per capita

	Resource-driven[2]	Not resource-driven
0–1,000	0.24	0.28
1,000–3,000	0.31	0.41
3,000–5,000	0.36	0.46
5,000–10,000	0.42	0.51
10,000–20,000	0.46	0.64
20,000–40,000	0.73	0.78
40,000+	0.88	0.90

1 MGI index is based on metrics covering productivity, inclusiveness, resilience, connectivity, and agility.
2 Includes six future resource-driven countries.
NOTE: Three resource-driven countries have been excluded due to lack of data.
SOURCE: McKinsey Global Institute analysis

There are three broad reasons for this. The first is that many countries have struggled to develop sufficiently competitive resources sectors and ensure that production and investment are somewhat shielded from volatility in resource prices. Some countries have failed to create a supportive business environment (for example, they have not dealt with infrastructure bottlenecks), have created political risk that deters investors, or have put in place inappropriate fiscal regimes. In some cases, resentment within government and among citizens about what they perceive to have been a failure to capture a "fair share" of resource

9 The MGI economic performance scorecard measures economic progress across five dimensions: productivity, inclusiveness, resilience, agility, and connectivity. See the appendix for further details on the methodology and the specific metrics used to assess performance.

10 PovcalNet, http://iresearch.worldbank.org/PovcalNet/index.htm.

rents has led to nationalization, which in turn has frequently precipitated a fall in foreign investment and a severe economic downturn.

Second, countries have often failed to spend their resource windfalls wisely. They have been unable to manage macroeconomic instability and corruption and have struggled to use resource rents for productive long-term investment that creates clear benefits for a large share of the population. Since 2000, the average annual volatility of metals prices has been twice as high as in the 1990s. Such volatility can result in overspending during booms and excessive borrowing during busts. Too often, governments flush with resources revenue have spent it wastefully, often losing funds through corruption or spending them on increasing public-sector salaries.

Finally, countries have struggled to develop non-resources sectors, and this has left their economies even more susceptible to volatility in resource prices. Resource-led export booms have often led to exchange-rate appreciation that has made other sectors, including manufacturing, less competitive in world markets and has led to domestic cost inflation. Such effects have been dubbed "Dutch disease," an expression coined by *The Economist* in 1977. These effects are often compounded by weak institutional development in these countries because the flood of money can encourage conflict and make governments complacent about putting in place the building blocks of long-term development.

Although we acknowledge that there are many pitfalls facing resource-driven countries, some have managed successful transformations, establishing best practice that other nations can emulate. Our analysis suggests that there are three areas to get right. The first is the effective development of resources, where there are issues related to the role of the state in developing effective institutions and governance of the resources sector and to ensuring that the right infrastructure is in place. The second is capturing value from resources. Here, it is important to examine not only fiscal policy—the exclusive focus of many governments striving to make their resources sectors competitive and attractive for investors—but also broader issues affecting competitiveness, such as production costs, political risk, and the provision of local content. Third, successful resource-driven countries have managed to use the value they receive from resources to build long-term prosperity. On this third imperative, we look at issues around spending resource windfalls wisely and how best to pursue effective economic development.

It is difficult to find appropriate measures to assess the performance of countries in each of the strategic areas we highlight, so we have used the best available proxies to identify the ten countries that have had the highest performance in each area (Exhibit E5).[11] We then considered the lessons from these countries (as well as other relevant examples) on the six aspects in these key areas. Even among these leading countries, we find significant opportunities to improve performance.

11 See the appendix for further details on the methodology.

Exhibit E5

Countries performing well across the six areas of the resources value chain

	Develop resources		Capture value		Transform value into long-term development	
	Institutions and governance	Infrastructure	Fiscal policy and competitiveness[1]	Local content development	Spending the windfall	Economic development
1	Norway	Canada	Canada	Canada	Norway	Norway
2	Canada	Malaysia	Chile	Norway	Australia	Qatar
3	Australia	Norway	Norway	Qatar	Canada	Australia
4	UAE[2]	Australia	Botswana	UAE[2]	Bahrain	Iceland
5	Chile	Lithuania	Mexico	Australia	Brazil	Canada
6	Iceland	Saudi Arabia	Australia	Iceland	Kuwait	UAE[2]
7	Qatar	Namibia	Bulgaria	Malaysia	Botswana	Israel
8	Brunei Darussalam	UAE[2]	Peru	South Africa	Colombia	Bahrain
9	Oman	Iceland	Brazil	Lithuania	Chile	Brunei Darussalam
10	Brazil	Azerbaijan	Colombia	Guatemala	South Africa	Chile

1 Analysis restricted to mining sectors due to data availability and comparability issues. The analysis is based on country risk, access to skills, regulatory duplication, and taxation. The assessment excludes other aspects of competitiveness, such as energy and wage costs, and other regulatory barriers.
2 United Arab Emirates.
NOTE: Based on a variety of publicly available sources of information. See the appendix for further details on the methodology.
SOURCE: Revenue Watch; World Economic Forum; World Bank; United Nations Educational, Scientific and Cultural Organization; UN Human Development Report; Yale Environmental Performance Index; Fraser Institute; Morningstar; International Monetary Fund; International Budget Partnership; McKinsey Global Institute analysis

INSTITUTIONS AND GOVERNANCE OF THE RESOURCES SECTOR

There is a common view that a government has only two choices in the way it participates in the resources sector: letting private-sector firms operate with minimal involvement from the state beyond taxation and regulation or controlling production through a state-owned company. However, the range of possible government roles is much wider than this, as the following examples illustrate:

- **No state ownership.** In Australia and Canada and elsewhere, the state does not have direct involvement in the industry but receives taxes or royalties or both.

- **Minority investor.** The state has a minority stake in a company but does not play an active role in its management or direction, as with Thailand's stake in PTT Exploration and Production (PTTEP).

- **Majority-owned, with limited operatorship.** The state has a majority stake in a company and plays a role in the company's management, but less than 10 percent of the company's production is operated by the state, or the state operates exclusively in certain segments such as onshore oil. Examples include the Nigerian National Petroleum Corporation (NNPC), Angola's Sonangol, and India's Hindustan Copper.

- **Majority-owned operator.** These companies are fully or majority-owned by the state, and more than 10 percent of the company's production is operated by the state company. Examples include Petrobras in Brazil, Norway's Statoil, and Debswana in Botswana.

- **Government monopolist.** Pemex in Mexico and Saudi Aramco in Saudi Arabia are fully owned by the state. Those and other companies in this category account for more than 80 percent of the country's total production.

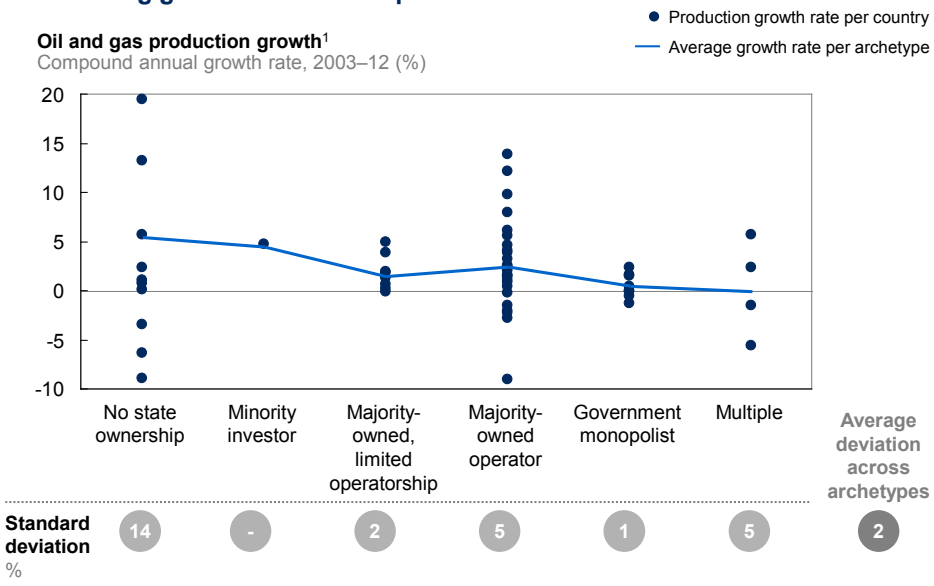
The popularity of each type of participation varies according to the resource. Today, more than half of oil and gas producers in our database, representing almost three-quarters of world production, are fully or majority state-owned. In contrast, governments have majority- or fully owned state companies in only about 24 and 20 percent of countries with iron ore and copper resources, respectively, accounting for 35 and 43 percent of production in each case.

Our analysis suggests that no single model of government participation works best in all countries—countries that have taken the same approach have experienced vastly different levels of success (Exhibit E6). The best approach depends on the context.

Regardless of the model chosen, three guiding principles are vital for successful state participation. First, governments need to establish a stable regulatory regime with clear rules and well-defined roles for each player in the sector. Second, it is important to ensure that there is competitive pressure by exposing national operators to private-sector competition, strongly benchmarking performance, or imposing other market disciplines such as scrutiny from private shareholders or bondholders. Finally, the state needs to play a central role in attracting and retaining world-class talent into the sector—even more important if the state chooses to play a more active operational role.

Exhibit E6

No one model of state participation has clearly outperformed others in achieving growth in resource production



1 Includes only countries producing more than 100 kilo-barrels of oil equivalent per day.
SOURCE: Rystad Energy; McKinsey Global Institute analysis

INFRASTRUCTURE

On average, resource-driven countries do not compare favorably with the rest of the world on their infrastructure, and this often puts investors off.[12] The Fraser Institute's survey of mining companies finds that more than 55 percent of investors considered infrastructure a deterrent to investment in 15 of the 58 countries analyzed.[13] Drawing on research by MGI and McKinsey's Infrastructure Practice, we estimate that resource-driven countries will together require more than $1.3 trillion of annual total infrastructure investment over the next 17 years to sustain projected economy-wide growth.[14] This is almost quadruple the annual investment that these countries made during the 17-year period from 1995 to 2012.[15]

This could be particularly challenging given that capital markets are not well developed in many resource-driven countries. However, these economies can help to address the infrastructure imperative by transforming the productivity of infrastructure investment—in other words, they can do more with less. Previous MGI research has identified three main levers that can help countries obtain the same amount of infrastructure for 40 percent less: improving project selection and optimizing infrastructure portfolios; streamlining delivery; and making the most of existing infrastructure, including sharing it. The third area is a particular opportunity for resource-driven countries given the large infrastructure requirements of major extractive projects.

Extractive companies are major investors and developers of infrastructure, and they are expected to invest almost $2 trillion in infrastructure in resource-driven countries in the period to 2030.[16] Given the huge need, we believe that resource-driven countries should look closely at ways of sharing infrastructure. By doing so, they can take advantage of private-sector capital and know-how; build stable, long-term partnerships with extractive companies; and achieve broader social benefits from the infrastructure that is put in place. We estimate that nearly 70 percent of investment in resource infrastructure could potentially be shared among different operators, and we see the largest opportunities in power in mining areas and pipelines in oil regions. The remaining 30 percent could potentially be shared between industry and other users. Examples include building roads that allow other users to benefit or ensuring that power capacity is sufficient to provide excess power to the grid. Of course, governments must carefully evaluate the likely costs and benefits of infrastructure sharing case by case. Overall it appears that power projects are good candidates for sharing as the benefits are high and coordination costs low. But port and rail projects, while often having substantial benefits, can create high costs related to sharing and therefore must be particularly carefully reviewed (Exhibit E7).

12 *Global competitiveness report 2012–2013*, World Economic Forum, 2012.

13 *Survey of mining companies 2012–2013*, Fraser Institute, February 2013.

14 *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute and the McKinsey Infrastructure Practice, January 2013. Our estimates include road, rail, port, airports, power, water, and telecommunications.

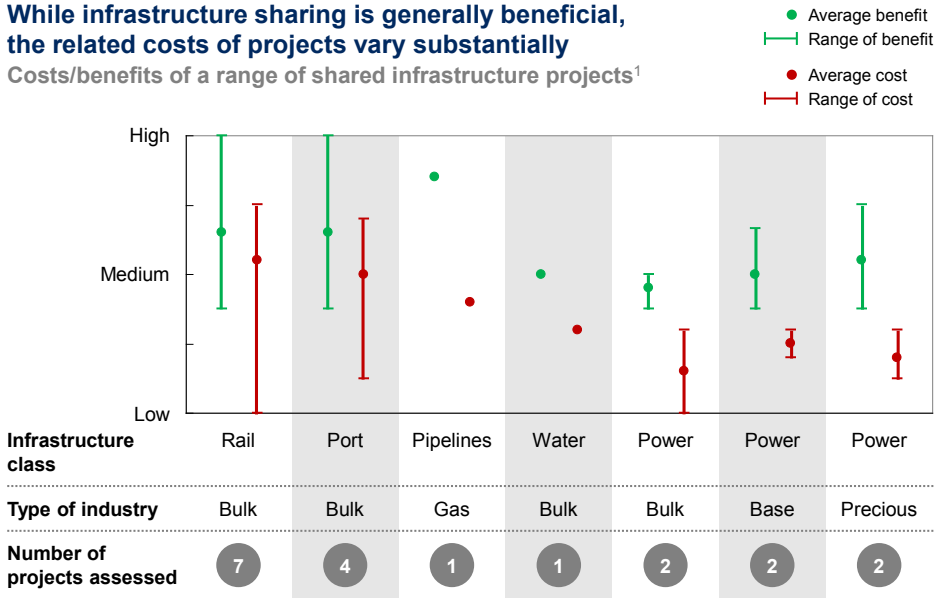
15 All figures in real 2010 US dollars.

16 This figure includes road, rail, port, power, and water facilities constructed by mining or oil companies as part of a specific project, and all crude and gas pipeline construction.

Exhibit E7

While infrastructure sharing is generally beneficial, the related costs of projects vary substantially

Costs/benefits of a range of shared infrastructure projects[1]



1 Based on an assessment of four types of benefits (economies of scale, economies of scope, spillover effects, and the likelihood of alternative investment) and five types of costs (efficiency loss, coordination issues, contracting issues, obstacles to future expansion, and issues with compensation mechanisms). Each benefit/cost was evaluated from 1 (low) to 3 (high) and then averaged across projects within the same category.

SOURCE: Vale Columbia Center; McKinsey Global Institute analysis

Governments need to think carefully about their approach to resource-related infrastructure to ensure that it provides the maximum benefits to society. Case studies suggest that the following lessons are important:

- **Plan early.** Early planning and coordination are essential to ensure infrastructure is delivered to maximize use and efficiency. In the Pilbara region of Western Australia, for example, much of the early infrastructure was built separately by mining operators with limited attention to sharing opportunities. Once made, these decisions prove much more difficult to "unwind."

- **Rigorously assess the costs and benefits of infrastructure sharing.** It is critical to conduct a detailed assessment of benefits such as economies of scale and scope, and potential costs related to contracts and difficulties in coordination.

- **Pick the right sharing model given the context.** We have identified five models for infrastructure sharing, which vary in terms of the users, operators, and owners. There is no one universally appropriate model. If infrastructure is to be provided by a third-party private operator, it is likely that the government will need to have strong regulatory capacity in order to provide that operator with incentives to invest without the promise of unreasonable returns that impose large costs on the government. Similarly, consortia models can be put in place only in situations where multiple extractive companies are operating in the same sector and the same area. Government provision requires a strong and effective state that has access to sufficient funds for investment in infrastructure.

COMPETITIVENESS AND FISCAL POLICY

Countries have much to gain from doing all they can to ensure that their resources sectors are as globally competitive as possible. A robust resources industry creates jobs, contributes to a government's finances through tax and royalty payments, and ensures sustained spending on exploration, increasing the viability of marginal deposits. National competitiveness becomes even more important as major new projects turn out to be more expensive and complex and as greater volatility in resource prices increases the risk of projects being postponed or canceled.

Yet governments in resource-driven countries have tended to focus too narrowly on fiscal policy, without considering the broader competitiveness implications for their economies. In this context, we created the McKinsey Resource Competitiveness Index, which encompasses three major elements of competitiveness: production costs, country risk, and the government "take" (the share of revenue that accrues to the government). Our approach takes into account the real economics of projects, including a country's geology and factors such as the availability of infrastructure and regulatory or policy risks. Governments have the ability to affect all three of the elements of competitiveness including, of course, how much of the revenue pie they will take by setting royalties and taxes.

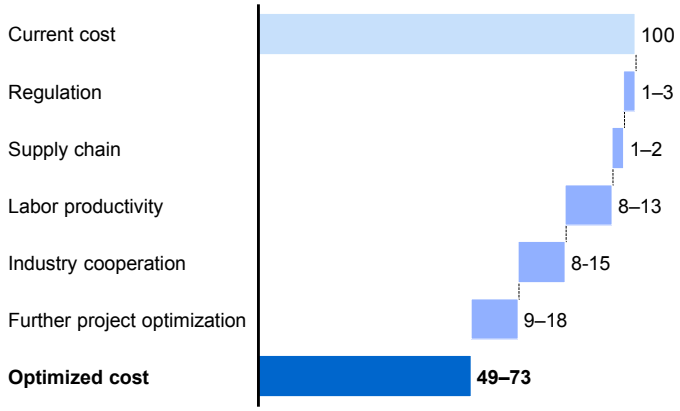
Production costs vary significantly relative to revenue depending on the type of resource and the geology of any particular asset. Costs (as a share of project revenue) are generally higher in mining than in oil and gas and for new sites. The index demonstrates that the government take is closely correlated to production costs. In essence, when production costs are high, the government take is necessarily lower to ensure that costs are competitive with alternative investments. This is true for individual resources and across resources. Governments obviously cannot control factors such as the proximity of resource deposits to the coast, the quality of crude oil, or mineral grades. But there are still avenues available to reduce capital and operating costs, especially by focusing on regulation, supply chains, productivity, and cooperation with the industry. Recent McKinsey work on liquefied natural gas (LNG) in Australia estimated that government and industry could reduce operating costs by more than 50 percent (Exhibit E8).

Political or regulatory risk (measured as a share of the value of a project) can sometimes amount to almost 40 percent of the value of the government take expressed as a percentage of revenue. This significantly weakens the competitiveness and attractiveness of the country. Even allowing for below-optimal levels of government take, this demonstrates the importance of risk to companies. There are large opportunities for governments to reduce risk by developing their ability to understand and negotiate contracts (ensuring that the contracts are fair and seen to be fair), adopting a set of formal legal mechanisms to help reassure investors, and generally improving interaction with investors and companies. Governments will achieve far more by focusing on production costs and reducing risks in collaboration with resource companies than by narrowly focusing on trying to increase the government take. Successfully reducing production costs and risks produces a larger revenue pie that can then be shared by the government and the resource companies.

Exhibit E8

McKinsey research estimates that government and industry action can cut costs by more than 50 percent

Impact on potential cost reduction measure by government and industry[1]
%



1 Based on McKinsey analysis of liquefied natural gas (LNG) projects in Australia.
NOTE: Numbers may not sum due to rounding.
SOURCE: *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey Oil & Gas and Capital Productivity Practices, May 2013; McKinsey Global Institute analysis

LOCAL-CONTENT DEVELOPMENT

Beyond generating taxes and royalties, the extractive industry can make substantial contributions to a country's economic development by supporting local employment and supply chains. Between 40 and 80 percent of the revenue created in oil and gas and in mining is spent on the procurement of goods and services, often exceeding tax and royalty payments in some cases.

Increasing the proportion of goods and services that are procured locally ("local content") is often a key goal for policy makers in resource-driven countries. In fact, we find that more than 90 percent of resource-driven countries have some form of local-content regulation in place.

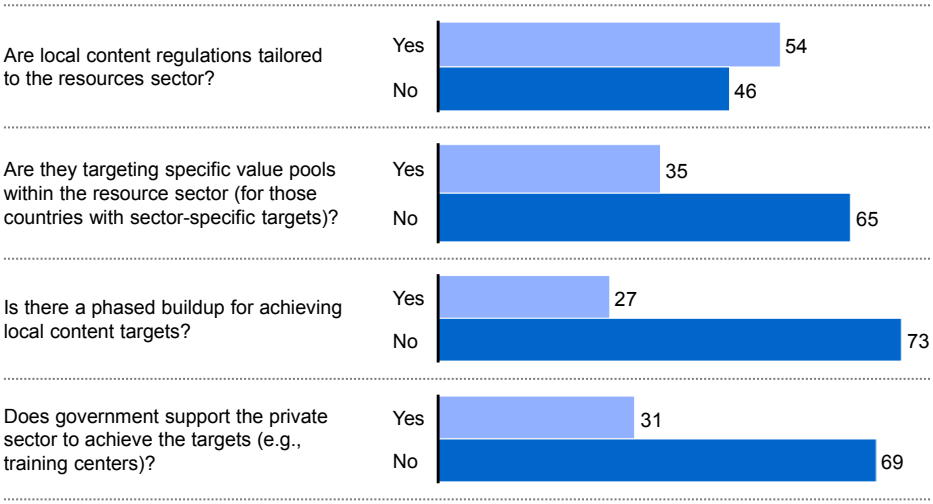
But if these regulations are designed poorly, they can substantially reduce the competitiveness of the resources sector, endangering the jobs and investment that it brings, as well as violate free trade agreements. Regulation can, for instance, cause cost inflation or delay the execution of projects. Brazil has increased local-content requirements to up to 65 percent in bidding rounds for offshore licenses. Given the profile of typical offshore production, this often implies that operators in Brazil are legally bound to source FPSO vessels locally. In the past, local operators took much longer to build these vessels than global companies, leading to significant project delays. While performance of Brazilian shipyard operators appears to have improved recently, there is still the potential risk of delays in project execution and production ramp-up.

Unfortunately, we find that much of the current local-content legislation does not appear to be well designed (Exhibit E9).

Exhibit E9

Current local content regulations are often not well designed

% (n = 27[1])



1 Sample is focused on the 27 (of the total set of 87) resource-driven countries that have hard legislation.
SOURCE: McKinsey Global Institute local content database; McKinsey Global Institute analysis

The following four gaps stand out:

- **Lack of sector-specific requirements.** Almost half of resource-driven countries in our sample had blanket requirements on local content that apply across all sectors.

- **Failure to target the right value pools.** Approximately two-third of countries in our database do not target specific value pools such as basic materials like steel and cement; low- to medium-complexity equipment and parts including pumps, explosives, and chemicals; or high-complexity equipment and parts. Of those countries that do target specific value pools within the resources sector, at least half fail to target the correct value pools in terms of fit with local capabilities. For example, the Democratic Republic of the Congo requires that 96 percent of roles in the mining sector—and 98 percent of management positions—be filled by nationals, but the number of people with the necessary technical and managerial skills and experience is simply not available.

- **No time frames stipulated or sunset clauses defined.** Very few resource-driven countries with local-content regulation take a phased approach in which they gradually build up the share of local content. Instead, most regulation calls for the immediate fulfillment of local-content shares. The result is either targets so high that they compromise competitiveness, in some cases preventing the resource from being developed at all, or so low that they are meaningless in terms of offering economic benefits to the local population. In addition, we found no evidence of any sunset clauses on the preferential treatment given to local firms in this legislation, potentially reducing the incentive of these firms to become globally competitive.

- **No supporting government institutions.** In more than two-thirds of the countries in our database, there is no structural government support for resource companies to achieve local-content targets through providing training centers, for instance, or financing for local suppliers to help them build up their businesses.

Our analysis of a number of case studies and McKinsey experience suggests that officials should apply the following five fundamental principles to achieve effective local-content policies:

- **Know where the value is and where the jobs are.** The first imperative is for policy makers to gain detailed knowledge of the resources supply chain so that they understand where total value is in terms of revenue and employment. In mining, our analysis implies that governments should focus on the production phase if they want to increase local content, because this is when the bulk of spending takes place. In this phase, the largest spending categories are manual and low-skilled labor; basic materials; management, and engineering, procurement and construction management (EPCM); business support services; and utilities. The patterns of spending in oil and gas projects are different from those in mining projects. In oil and gas, a much larger share of total procurement funds is spent on integrated plant equipment solutions and a much lower share on manual and low-skilled labor. The potential to create jobs also differs from total procurement spending in many cases. Several categories are relatively more labor-intensive and therefore create more jobs than other categories.

- **Understand the competitive edge.** The spending that can be captured locally varies significantly among countries due to a number of factors, including the type of resource, the level of industrialization, the country's unique aspects such as location and language, and whether other industries have a significant presence. We find that in advanced economies such as Australia, up to 90 percent of total (mining) spending in the production phase is highly amenable to local content. In underdeveloped countries that have not yet industrialized and that have relatively new resources sectors—Guinea being an example—very little of overall spending is amenable to local content, at least initially.

- **Carefully assess the opportunity cost of regulatory intervention.** When governments impose local-content requirements, they must carefully assess whether regulations are too unwieldy for companies, unnecessarily raising costs, potentially causing significant delays, and damaging competitiveness. They should also guard against creating perverse incentives. For example, regulation that automatically gives contracts to any local provider bidding within 10 percent of the best price will discourage local firms from becoming competitive with multinationals unless there is a clear sunset clause that stipulates when this preferential support will end.

- **Don't just regulate—enable.** Most resource-driven countries devote too little attention to creating an environment that supports the achievement of local-content targets. Government can assist in a number of areas, from helping to develop skills to providing financing and coordinating local suppliers.

- **Carefully track and enforce progress.** Making procedures simple to administer and track, appointing a credible regulator with enforcement power, and creating a regulatory body that can coordinate efforts are crucial to making progress on local content.

Private companies play an essential role in the development of local content. There are numerous cases in which a private company took the lead in developing local suppliers, not only to comply with local-content regulation but also to improve their cost competitiveness. It is crucial for companies to have a detailed understanding of their future spending profile and the local supplier base; to organize effectively to achieve their local-content goals by rooting them deeply in company processes for procurement and human resources rather than corporate social responsibility; to engage proactively with the government as they make local-content policy decisions; and to support the development of local supply chains through targeted skill-building and R&D programs.

SPENDING THE WINDFALL

There is a broad range of approaches for governments to use resource revenues. They can invest the money abroad or use it to repay foreign debt; MGI research has shown that sovereign wealth funds worldwide controlled $5.6 trillion at the end of 2012 and that 57 percent of this sum came from natural resources. Countries can also invest at least a portion of their resources revenue at home in infrastructure and other key areas. Botswana, for instance, earmarks mining revenue for specific development purposes such as education and health through its Sustainable Budget Index. Some countries direct a share of revenue to specific regions for both investment and consumption purposes. Brazil splits its disbursement of CFEM (Financial Compensation for the Exploration of Mineral Resources) mining royalties so that 65 percent goes to local governments, 23 percent to mining states, and the remainder to the National Department of Mineral Production. Governments can also use resources revenue more generally for domestic needs such as higher wages for public-sector workers, subsidies for energy resources, or other social-welfare programs. Finally, they can make direct transfers to citizens, as Alaska does with a portion of its oil revenue.

History is littered with examples of governments squandering resource windfalls either through corruption or simple mismanagement. Such waste can, and must, be avoided. While the best approach may vary somewhat depending on the country, there are some valuable lessons from international experience to date that we think broadly apply. Governments should consider the following if they are to reap the full benefits of their resource endowments:

- **Set expectations.** In order to counter ill-informed pressure that could lead to wasteful spending, governments need to agree early in the process on the principles for how the resource wealth will be used and manage expectations among their citizens accordingly. In Ghana, the government undertook an extensive consultative exercise to discuss how to use the country's oil wealth, and interestingly, the country's poorest regions were the most eager to save funds.[17] When Botswana discovered its diamond wealth, the government quickly spread the message, "We're poor and therefore we must carry a heavy

17 Joe Amoako-Tuffour, *Public participation in the making of Ghana's petroleum revenue management law*, National Resource Charter Technical Advisory Group, October 2011.

load." This message helped the government to justify investing more of the money rather than spending it.

- **Ensure spending is transparent and benefits are visible.** Governments need to ensure that institutional mechanisms are put in place for a high level of transparency so that recipients see the benefits of invested resource windfalls. In Uganda, the finance ministry sends details to the local media of all the money each school receives from the state. This has resulted in 90 percent of non-salary funding actually getting to schools instead of around 20 percent as in the past (with the remainder being misappropriated). In Botswana, the government's Sustainable Budget Index monitors whether the mineral revenue it collects is being used to promote sustainable development and finance "investment expenditure," including recurrent spending on education and health.[18]

- **Smooth government expenditure.** Setting a target for the non-commodity government budget balance can insulate public expenditures from volatility. During periods of relatively high commodity prices or output, the overall budget might accumulate a surplus, while during periods of low prices or output it might run a deficit but leave spending intact. For example, Chile has established a budget balance rule, defined in structural terms, with provisions that correct for deviations in the prices of copper and molybdenum from their long-term levels, as judged by an independent panel of experts.[19]

- **Keep government lean.** Resource-driven countries often suffer from bloated government bureaucracies. In Kuwait and the United Arab Emirates, for instance, more than 80 percent of the local population is employed in the public sector. Pay increases can be large. The government of Qatar raised public salaries by 60 percent in 2012. Such approaches reduce not only public-sector productivity but also incentives for working in the private sector, inhibiting wider economic development. Governments should actively seek to keep the public sector in proportion by regularly comparing ratios for each function with those of other countries. They should also consider how they can consistently recognize duplicative structures in the public sector that could be consolidated.[20] One method to keep pay consistent is to benchmark wages to similar jobs in the private sector and to assign public-sector roles a "clean wage" without hidden perks or privileges.

- **Shift from consumption to investment.** Channeling some of the resource wealth into domestic investment and savings is crucial to start transforming natural resource wealth into long-term prosperity. Establishing institutional mechanisms to support this process can be useful, because they can address any bias toward government consumption spending and deficits, enhance fiscal discipline, and raise the quality of debate and scrutiny. For example, Australia established the Parliamentary Budget Office in July 2012 to provide independent and non-partisan analysis of the budget cycle, fiscal policy, and the financial implications of proposals.

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18 *Towards mineral accounts for Botswana*, Department of Environmental Affairs, May 2007.

19 *Fiscal rules: Anchoring expectations for sustainable public finance*, IMF discussion paper, December 2009.

20 *Transforming government performance through lean management*, McKinsey Center for Government, December 2012.

- **Boost domestic capabilities to use funds well.** Resource-driven governments need to ensure the development of strong investment capabilities in the public sector. The International Monetary Fund (IMF) and the World Bank jointly produce an index of public investment efficiency, enabling countries to track progress in this area.[21] Some of the key areas to address include project appraisal, selection, implementation, and auditing.

ECONOMIC DEVELOPMENT

Very few resource-driven countries have sustained strong GDP growth for longer than a decade. Even those that have appeared to put their economics on a healthier longer-term growth trajectory have rarely managed to transform that growth into broader economic prosperity, as measured by MGI's economic performance scorecard. But doing so is not impossible. One major imperative for governments is to focus on removing barriers to productivity across five key areas of the economy—the resources sector itself; resource rider sectors such as utilities and construction; manufacturing; local services such as retail trade and financial services; and agriculture. Local services, which include hospitality, telecommunications, and financial sectors, are often seen as the indirect beneficiaries of the resource booms. These sectors can achieve large productivity improvements, which can often result in significant growth in GDP and employment, but these sectors are often overlooked by policy makers. Past MGI work has highlighted how removing microeconomic barriers can significantly increase productivity and economic growth.[22]

The extractive industry has much to gain from being more thoughtful about economic development

Governments in resource-driven economies are being tested, but so are extractive companies operating in these environments. They face three factors that put value at risk in these economies.

The first of these is that high and volatile resource prices have led to significant choppiness in resource rents and increased the likelihood that governments feel "cheated" and seek to renegotiate terms. Data from the Royal Institute of International Affairs (Chatham House) show that the incidence of arbitration corresponds strongly with the rise in oil and metal prices and mineral prices since 2000.[23] Second, exploration and production are increasingly moving toward lower-income, less-developed markets that are often environmentally and logistically challenging and geologically complex. This is driving up project costs and increasing the risk of delays. Finally, extractive projects represent a disproportionate share of these economies. For instance, the Simandou iron ore project in Guinea is expected to produce revenue in excess of 130 percent of the country's current annual GDP, based on forecast iron ore prices and production growth. Extractive companies engaged in large projects such as these have a very visible role in the economies in which they operate. They are subject to

21 Era Dabla-Norris et al., *Investing in public investment: An index of public investment efficiency*, IMF working paper number 11/37, 2010.

22 *Investing in growth: Europe's next challenge*, McKinsey Global Institute, December 2012.

23 Bernice Lee et al., *Resources futures*, Chatham House, December 2012.

greater scrutiny in the media and among citizens, who have elevated expectations of the jobs these companies create and the tax revenue they provide.

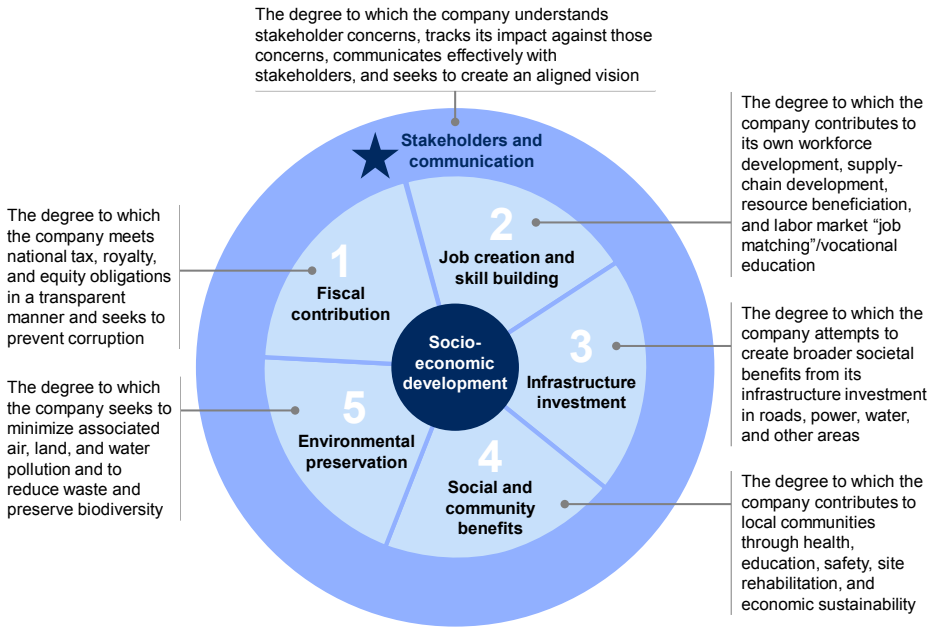
Managing this evolving and risky landscape requires extractive companies to shift from an "extraction" mindset to a "development" one. It would help them to navigate the journey if they were to take a more strategic approach to their local development activities. They need to ensure that their chosen development priorities reflect a detailed understanding of the country in which they are operating and that these same development priorities create lasting value to their businesses. They also need to embed the actions they take in a relationship with host governments that creates strong incentives for both parties to adhere to agreements throughout the lifetime of the project.

In developing an understanding of the host country, companies need to start with the geographical, social, economic, institutional, and other factors directly related to resources. Then they need to go beyond a basic analysis of political, institutional, and economic trends in the country to consider fundamental questions such as the history of the country and its resources sector. They should also assess how dependent government finances are on resource endowments, as well as competitiveness factors such as the country's position on the global cost curve for a particular resource and its importance to global supply.

Second, companies need to be rigorous in assessing their own contribution to broader economic development and compare their performance with stakeholders' expectations. We have developed a tool to assess the economic contributions that companies make. It looks at five aspects: fiscal contribution; job creation and skill building; infrastructure investment; social and community benefits; and environmental preservation. The tool examines whether companies match the expectations of key stakeholders such as host governments and local communities in each of the five core areas (Exhibit E10).

Exhibit E10

We identify five core elements of a company's local development contributions, and one critical enabler


The degree to which the company understands stakeholder concerns, tracks its impact against those concerns, communicates effectively with stakeholders, and seeks to create an aligned vision
Stakeholders and communication
The degree to which the company contributes to its own workforce development, supply-chain development, resource beneficiation, and labor market "job matching"/vocational education
2
Job creation and skill building
The degree to which the company meets national tax, royalty, and equity obligations in a transparent manner and seeks to prevent corruption
1
Fiscal contribution
Socio-economic development
3
Infrastructure investment
The degree to which the company attempts to create broader societal benefits from its infrastructure investment in roads, power, water, and other areas
The degree to which the company seeks to minimize associated air, land, and water pollution and to reduce waste and preserve biodiversity
5
Environmental preservation
4
Social and community benefits
The degree to which the company contributes to local communities through health, education, safety, site rehabilitation, and economic sustainability

SOURCE: McKinsey Economic Development Assessment Tool; McKinsey Global Institute analysis

Our analysis finds that companies' efforts often do poorly in matching the expectations of host governments. In one instance, the company prioritized, and was performing strongly in, all areas of environmental management, but far less well on infrastructure and job creation. Yet the latter two were the main areas of concern for the local government. Furthermore, our pilots in this area indicate that the performance and priorities of different parts of the same company varied. We also find that companies have generally done a poor job of communicating their efforts and of understanding and engaging with key stakeholders.

Finally, any package of initiatives needs to be part of a relationship with host governments that will endure for the lifetime of the project, which can stretch for decades. The specific ways in which companies make an effective contribution will depend on the context, but our work with extractive clients suggests some core guiding principles. These include being careful about signing agreements that optimize for the short term but that could later be regarded by governments as unfair and grounds for renegotiation; making it clear to governments what is at stake by being transparent about the short- and medium-term contribution of the resources sector to jobs, exports, and fiscal revenue; ensuring that the company is seen as indispensable to the country's broader agenda through, for example, the technological know-how it brings, the international capital it can mobilize, and its contribution to the country's economic development; and being willing to play tough in the case of reneging on agreements (using all available legal remedies). On the latter point, an example is ExxonMobil, which seized Venezuela's "cash waterfall" funds as compensation for the nationalization of the company's assets.

There will always be circumstances that an extractive company will find difficult or even impossible to manage. But taking such a strategic approach to local development issues can help avoid time-consuming efforts on a range of "nice-to-do" economic development contributions and enable extractive companies to spend more time and effort on helping host governments to create a genuine new source of enduring competitive advantage.

□ □ □

The “Asian Tiger” economies of Hong Kong, Singapore, South Korea, and Taiwan are noted for having achieved rapid economic growth from 1960 to 1990 though industrialization and export-led manufacturing. More recently, China has largely followed this growth model, taking more than 500 million people out of poverty. Some resource-driven countries have tried to emulate the successful development models of the Asian Tigers. However, this approach fails to take into account the unique circumstances of economies driven by resources. Instead, they should consider reframing their economic strategies around three key imperatives: effectively developing their resources sector; capturing value from it; and transforming that value into long-term prosperity. In each of these areas, relevant lessons from other resource-driven countries can be tailored to the local context. This new “Resource Tiger” growth model has the potential not only to transform the economic prospects of these resource-driven economies, but also to take more than 500 million people out of poverty by 2030, and thus achieve as great an impact as the Asian Tiger growth model.

1. The changing resource landscape

Demand for natural resources has grown strongly since 2000, and, while prices have softened slightly in recent years, long-term demand for resources will continue to be fueled by an expanding global consuming class. At the same time, new supply will be needed as existing sources come to the end of their useful lives.

If the world is to meet expected demand for resources to 2030, it needs to invest an additional $11 trillion to $17 trillion in the resources sector—even if there is a significant improvement in resource productivity. Historically almost 90 percent of that investment has taken place in high-income and upper-middle-income countries. But in the future, the share of resource investment going outside these two groups—in other words, to low-income and lower-middle-income countries—could increase significantly. Our research suggests that larger amounts of money than in the past will flow not only to existing resource-rich countries, but also to countries that have discovered resources more recently. We also find that the number of countries whose economies will be driven to a material extent by energy and mineral natural resources will increase as a consequence.[24] Their number has already grown from 58 in 1995 to 81 in 2011.

If sufficient investment flows into resources to meet demand, low-income and lower-middle-income resource-driven countries could transform their economies. We estimate that the opportunity could be worth up to $3 trillion in cumulative investment to 2030. On an annual basis, this is more than triple what these countries currently receive each year in aid flows. If this investment can enable these countries to match the poverty reduction of historically high-performing, resource-driven countries, this could lift more than 500 million people out of poverty; a similar number has left the ranks of the poor in China in the past 20 years. However, this is a big "if," given the fact that resource-driven countries have struggled to translate the wealth that lies beneath the ground into long-term prosperity.

24 We use three criteria to determine which economies are driven by resources to a material extent: (1) resources account for more than 20 percent of exports; (2) resources generate more than 20 percent of fiscal revenue; or (3) resources rents are more than 10 percent of economic output. The resources include energy and mineral commodities. See the appendix for further details on the methodology and the full list of resource-driven countries.

The number of resource-driven countries has increased by more than 40 percent since 1995

Over the past century, progressively cheaper resources have underpinned global economic growth and shaped the resources sector. Although demand for resources such as energy and minerals grew, this was offset by expanded supply and increases in the productivity with which supply was used. Despite some volatility, global prices of energy and minerals, as measured by the McKinsey Global Institute Commodity Index, were no higher at the end of the 20th century than they were at the beginning.[25] This is in many ways surprising given that demand for different resources jumped by between 600 and 2,000 percent during the 20th century as the world's population quadrupled and global economic output increased approximately 20-fold. The reasons that this huge increase in demand didn't translate into higher prices were technological innovation and the discovery of new, low-cost sources of supply. Moreover, in some cases, resources were not priced in a way that reflected the full cost of their production (because of energy subsidies or unpriced water, for instance) and externalities associated with their use such as carbon emissions.[26]

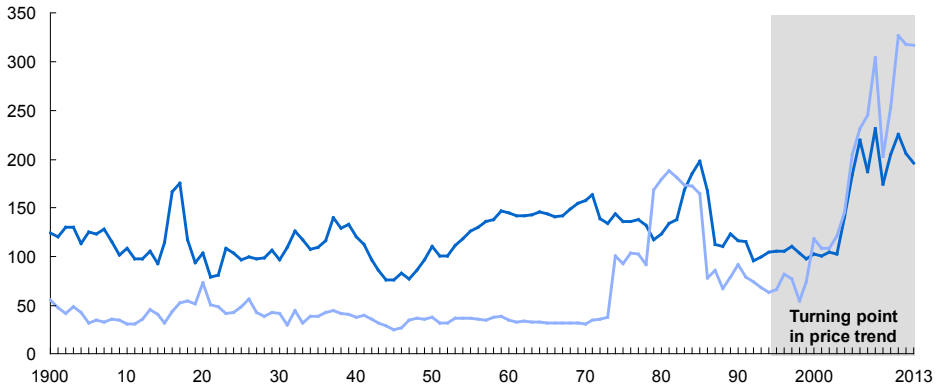
However, the resource landscape has been transformed since the turn of the century. Average minerals prices have roughly doubled, and energy prices have tripled (Exhibit 1). This has led to a strong increase in the production of energy and minerals, by 14 percent in the case of oil to more than 100 percent in the case of iron ore since 2000. Despite recent declines in some resource prices such as iron ore over the past two years, commodity prices on average remain

Exhibit 1

Energy and metals prices have more than doubled since the turn of the century

McKinsey Commodity Annual Price Index—minerals and energy[1]

Real price index: 100 = years 1999–2001



1 Minerals include copper, steel, aluminum, tin, lead, and zinc. Energy includes coal, oil, and natural gas. Data before 1922 do not include natural gas prices.

SOURCE: Grilli and Yang; Pfaffenzeller; World Bank; International Monetary Fund; Organisation for Economic Co-operation and Development statistics; United Nations Food and Agriculture Organization; United Nations Comtrade; McKinsey Global Institute analysis

25 The resources covered include oil, coal, gas, steel, copper, aluminum, tin, lead, and zinc. For further details on the methodology, see *Resource Revolution: Tracking global commodity markets*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, September 2013.

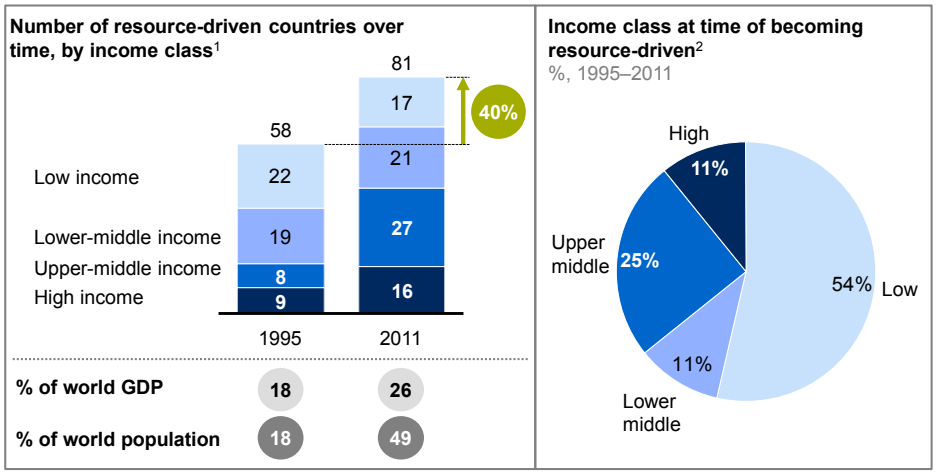
26 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

roughly at their levels in 2008 when the global financial crisis began. They have also risen more sharply than global economic output since 2009.[27]

As a result of rising resource prices and production, the number of countries in which resources represent a significant share of their economy has increased significantly. In 1995, there were 58 resource-driven economies that accounted for 18 percent of global economic output. By 2011, there were 81 such countries accounting for 26 percent of global economic output (Exhibit 2).

Exhibit 2

The number of resource-driven countries has increased by more than 40 percent since 1995, and most new ones have low average incomes



1 We define resource-driven countries using three criteria: (1) resources are more than 20 percent of exports; (2) resources are more than 20 percent of fiscal revenue; or (3) resource rents are more than 10 percent of GDP. Where data were not available, we estimated based on the nearest year's data.
2 World Bank income classifications based on per capita gross national income (GNI) by country; thresholds updated annually. In 2011, the World Bank thresholds for categorization were $1,026 for lower-middle income, $4,036 for upper-middle income, and $12,476 for high income.
NOTE: Numbers may not sum due to rounding.
SOURCE: UNCTADstat; International Monetary Fund; World Bank; IHS Global Insight; McKinsey Global Institute analysis

Many of these new resource-driven countries have very low incomes. Of the countries that have become resource-driven by our definition since 1995, the World Bank defined more than half as low income at the time.[28] The composition of the group of resource-driven countries has shifted toward the upper-middle-income category because of recent improvements in the income levels in existing members, in many cases driven by effective development of their resources sectors. However, more than half of new "entrants" were low-income economies when they became resource-driven. In addition to the 81 current resource-driven countries, our research and analysis includes six more countries that the IMF has identified as prospective exporters of natural resources.[29]

27 *Resource Revolution: Tracking global commodity markets*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, September 2013.

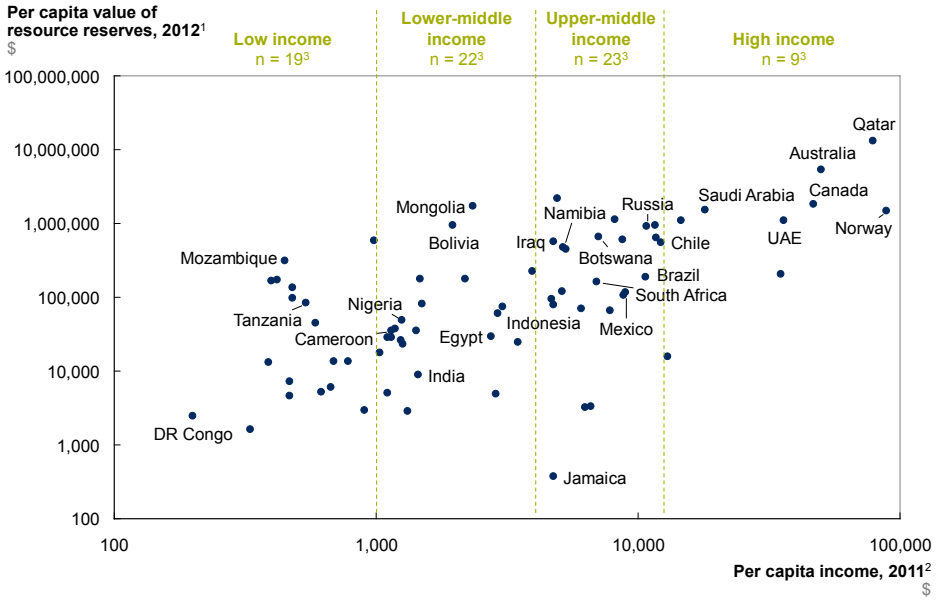
28 World Bank income classifications are based on per capita gross national income. Thresholds are updated annually. In 2011, the World Bank's income thresholds were: low income, $1,025 or less; lower-middle income, $1,026–$4,035; upper-middle income, $4,036–$12,475; and high income, $12,476 or more.

29 Afghanistan, Guatemala, Madagascar, São Tomé and Principe, Togo, and Uganda. For further details, see *Macroeconomic policy frameworks for resource-rich developing countries*, IMF, August 2012.

Resource-driven countries vary significantly in their economic and institutional development and in their resource wealth (Exhibit 3). They range from Norway, which has one of the highest average incomes in the world ($98,960), to the Democratic Republic of the Congo, where the average annual income is just $220. Of the top ten most effective governments measured by the World Bank's Worldwide Governance Indicators, resource-driven countries account for only one (Norway), but they also account for six of the bottom ten. Some resource-driven countries, including Australia, Norway, and Canada, have stable political systems, while others suffer from instability. Out of 35 fragile country situations identified by the World Bank in 2013, 19 were in resource-driven countries.[30] Given the very different starting points of these countries, the appropriate strategy for policy makers and extractive companies will vary, as we discuss in Chapters 2 and 3.

Exhibit 3

Most resource-driven countries fall into the lower- and middle-income brackets and have significant variations in known reserves



1 Includes reserves of oil, gas, iron ore, coal, copper, gold, nickel, silver, potash, and phosphate rocks (valued in current prices).
2 Per capita GNI in current prices; 2011 World Bank thresholds for categorization are $1,026 for lower-middle income, $4,036 for upper-middle income, and $12,476 for high income.
3 The sample size includes future resource-driven countries identified by the IMF (Afghanistan, Guatemala, Madagascar, São Tomé and Príncipe, Togo, and Uganda); 14 countries were excluded due to lack of data.
SOURCE: World Bank; McKinsey Global Institute analysis

30 *Harmonized list of fragile situations FY13*, World Bank, 2013.

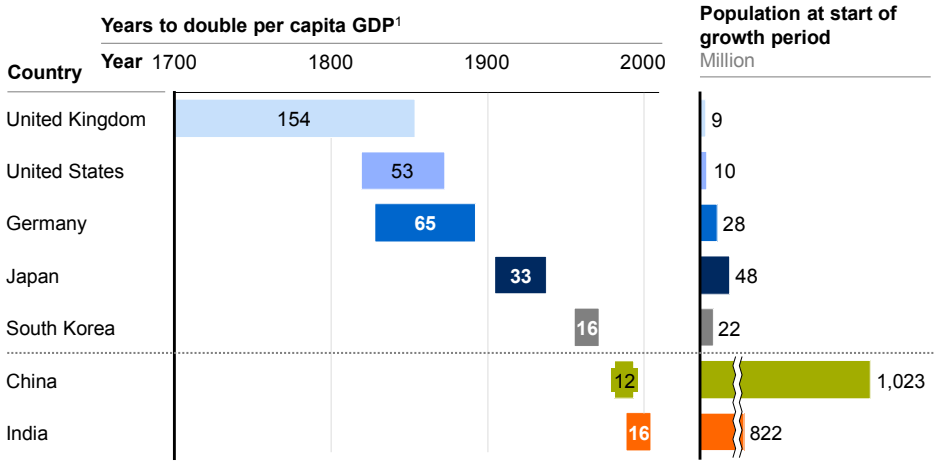
Up to $17 trillion of cumulative investment in resources could be needed to meet future demand

It is not possible to be certain about how resource prices and demand will evolve, and therefore the impact on growth in resource-driven economies. Many factors will determine prices in the years ahead (see Box 1, "The drivers of future resource market dynamics"). However, one factor should not be underestimated—the scale of potential demand from the 1.8 billion additional people who will join the world's consuming class by 2025.[31]

Average incomes are increasing on an unprecedented scale and at a speed that has never before been witnessed. Consider that the United Kingdom doubled real per capita GDP from $1,300 to $2,600 in purchasing power parity (PPP) terms in 154 years with a population of less than 10 million. The United States, starting 120 years later, achieved this feat in 53 years with a population of a little over 10 million. In the 20th century, Japan doubled its real per capita income in 33 years with a population of around 50 million. Now China and India, whose combined population is more than 2.5 billion, are doubling real per capita incomes every 12 and 16 years, respectively. This is about ten times the speed at which the United Kingdom achieved this transformation—and on around 200 times the scale (Exhibit 4).

Exhibit 4

Incomes are rising in developing economies faster—and on a greater scale—than at any previous point in history



1 Time to increase per capita GDP (in PPP terms) from $1,300 to $2,600.
SOURCE: Angus Maddison; University of Groningen; McKinsey Global Institute analysis

31 We define members of the consuming class as those with daily disposable income of more than $10 at PPP, and we draw on the McKinsey Global Institute Cityscope 2.0 database. In 2010, we estimated that there were 2.4 billion people in the global consuming class, which we forecast to rise to 4.2 billion by 2025.

Box 1. The drivers of future resource market dynamics

Given that the volatility of natural resources prices is at an all-time high, the outlook for resource markets is uncertain. Nevertheless, four sets of factors are likely to be important influences on prices:[1]

- **Emerging-market demand.** The largest uncertainty in forecasting energy and minerals demand is the rate of growth in demand for resources in China and India. These two economies together are forecast to account for 60 percent of the total increase in primary energy growth by 2030 and more than half of the total increase in demand for steel.[2] But the extent of demand for different resources will depend on overall economic growth in these countries and the resource intensity of that growth. Take energy consumption in China, for example. Incremental world energy demand could swing by up to 15 percent depending on a range of plausible published projections of China's future growth rate and energy intensity (energy inputs per unit of economic output). We project that China's primary energy demand will grow by more than 2 percent per annum, accounting for more than 40 percent of incremental global energy demand to 2030. We base this projection on growth in China's real GDP of 6.8 percent per year.[3] In most developed countries, per capita energy consumption generally grows consistently until household income hits a threshold of $15,000 to $20,000 in PPP terms. Consumption then typically flattens as economies shift away from energy-intensive industries such as manufacturing toward less energy-intensive service industries. China's current energy intensity is around the levels of South Korea and Singapore in the late 1980s.[4] We assume that, by 2030, China will reach per capita energy intensity around the level observed in South Korea and Singapore in the late 1990s.

- **More challenging access to sources of supply.** As the quality of existing reserves deteriorates, production is shifting to more complex sources of supply in energy and minerals. In the case of energy, tar sands and deep-water oil are typical examples of this greater complexity. Mineral reserves are increasingly in places that have very weak infrastructure or that are subject to considerable political instability. Almost half of new copper projects are in countries that pose high levels of political risk. This means that there is a greater chance of disruptions to supply and that supply is even more inelastic.

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1 For further details, see *Resource Revolution: Tracking global commodity markets*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, September 2013.

2 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

3 This economic growth projection comes from IHS Global Insight. Some economists, including Michael Spence and Barry Eichengreen, argue that China may find it difficult to sustain its fast growth rate as it makes the transition to a middle-income country. See Michael Spence and Sandile Hlatshwayo, *The evolving structure of the American economy and the employment challenge*, Council on Foreign Relations working paper, March 2011; and Barry Eichengreen, Donghyun Park, and Kwanho Shin, *When fast growing economies slow down: International evidence and implications for China*, NBER working paper number 16919, March 2011.

4 We base historical per capita energy intensity on final, rather than primary, energy demand.

Box 1. The drivers of future resource market dynamics (continued)

- **Incorporation of environmental impact.** The mining and energy industry is likely to face increasing pressure from regulators to pay for inputs such as carbon and water that are largely unpriced today. For example, pricing water could have a dramatic impact on mining costs—and could constrain output—given that 32 percent of copper mines and 39 percent of iron ore mines are in areas of moderate to high water scarcity, according to Trucost. Analysis by McKinsey and Trucost shows that pricing water to reflect its "shadow cost" (the economic value of the water if put to its best alternative use) could increase iron ore costs by 3.3 percent across the industry. A price of $30 per tonne of carbon emissions could increase the cost of iron ore by 2.5 percent. In water-scarce regions, some operators could face increased expense of up to 16 percent from the combined costs of water and carbon. They also face the risk of stranded resource assets (that is, environmentally unsustainable assets that have suffered from unanticipated or premature write-offs, downward revaluations, or conversion to liabilities if there is strong policy action to combat climate change).[1] Recent research has shown that the total carbon potential of Earth's known fossil fuel reserves is equivalent to nearly five times the carbon budget for the next 40 years that would be needed to limit the probability of global warming exceeding two degrees Celsius to 20 percent.[2] Of the total carbon potential of known fossil fuels, 65 percent is from coal, 22 percent from oil, and 13 percent from gas. Strong global action to limit the potential for global warming could potentially result in many of these high carbon-emitting assets not being developed.

- **The technology opportunity.** While the first three factors will push resource prices higher, technology improvements should, as they have in the past, lead to declining prices because they enable the cost-effective extraction of energy and metals, as well as productivity improvements in their consumption. Aluminum prices dropped sharply in the 1910s due to the commercialization of the low-cost process of refining alumina from bauxite. More recently, the unconventional oil and gas boom in the United States has demonstrated the potential for new technologies to have a significant impact on the cost of energy. In 2012, the International Energy Agency (IEA) said that the United States could become the world's biggest oil producer by 2017 by continuing to harness its light tight oil reserves through fracking.[3] In addition, past McKinsey research has found opportunities, from boosting the energy efficiency of buildings to the development of industrial motor systems, that could reduce energy demand in 2030 by more than 20 percent.[4] But significant uncertainty remains about the degree to which technological advancements that improve cost efficiency can offset rising costs associated with the decreasing quality of reserves, and whether other barriers to new technology development can be overcome.

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1 Definition used in "The Stranded Assets Programme" at the University of Oxford's Smith School of Enterprise and the Environment.

2 *Unburnable carbon: Are the world's financial markets carrying a carbon bubble?* Carbon Tracker Initiative, March 2012.

3 *World energy outlook 2012*, International Energy Agency, November 2012.

4 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

Demand for energy, materials, and other resources is likely to rise rapidly as new waves of middle-class consumers emerge. By 2030, the global car fleet is expected to increase by roughly 70 percent (from 2010 levels) to 1.7 billion. Demand for urban infrastructure is expected to soar. Every year, China is adding floor space totaling 2.5 times the entire residential and commercial square footage of the city of Chicago. India could potentially add floor space equal to another Chicago each year to meet the needs of its urban citizens.[32] Past MGI research has predicted that 136 new cities will enter the top 600 by 2025 based on their contribution to global output. All of these will be in developing economies, with the vast majority—100 new cities—in China.[33]

Alongside soaring demand, the supply landscape is changing significantly. Most supply to date has come from OECD countries, but many existing sources are coming to the end of their useful lives. Previous MGI research has estimated that supplies of energy and steel will need to grow 30 to 60 percent faster than they have over the past 20 years. Almost three-quarters of that supply in the case of energy, and more than 20 percent in the case of steel, is due to the need to replace existing sources of supply.[34] Peter Voser, chief executive officer of Shell, said in 2011 that the equivalent of "four Saudi Arabias or ten North Seas over the next ten years" needs to be added just to replace declining production and to keep oil output flat.[35] Even if the world achieved a step change in resource productivity, new sources of supply would be necessary.

Meeting rising demand and replacing existing supply will require large amounts of new investment. Even if we assume a significant improvement in resource productivity and shifts in the primary energy mix consistent with achieving a 450-ppm carbon pathway, MGI estimates that $11 trillion to $17 trillion will need to be invested in oil and gas, and minerals extraction by 2030.[36] This is 65 to 150 percent higher than the historical investment rate (Exhibit 5).

32 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

33 For a complete discussion, see *Urban world: Mapping the economic power of cities*, McKinsey Global Institute, March 2011.

34 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

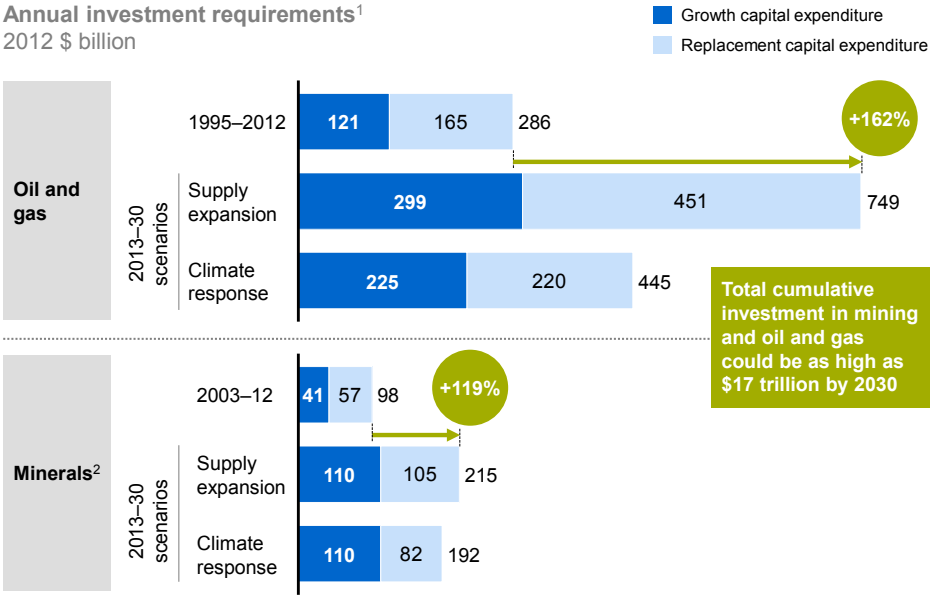
35 "Rush is on to develop smarter power," *Financial Times* Special Report, September 29, 2011.

36 A 450-ppm pathway describes a long-term stabilization of emissions at 450-ppm carbon dioxide equivalent, which is estimated by the Intergovernmental Panel on Climate Change (IPCC) to have a 40 to 60 percent chance of containing global warming below the 2° C threshold by the end of the 21st century.

Exhibit 5

Investment in oil and gas and minerals may need to increase at more than double historical rates to meet new demand and replace existing supply

Annual investment requirements[1]
2012 $ billion



1 See the appendix for further details on the methodology.
2 Includes iron ore, coal, copper, and an estimate for other mineral resources.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Energy Insights; McKinsey Basic Materials Institute; Wood Mackenzie; Rystad Energy; IHS Global Insight; World Bank; McKinsey Global Institute analysis

Low-income and lower-middle-income resource-driven countries could transform their economies over the next 20 years

Soaring demand for resources is a potential windfall for all resource-driven countries, but for low- and lower-middle-income economies in particular. Resource-driven economies as a group are home to a disproportionately high number of the poor in the world—almost 70 percent of the global population still lives below the poverty line.[37] They also have a significant share of global resource reserves. Almost half of the world's mineral and oil and gas reserves are in non-OECD, non-OPEC countries (Exhibit 6). However, that share could be significantly higher because relatively little exploration has taken place in low- and lower-middle-income countries. In OECD countries, an estimated $130,000 of known sub-soil assets lies beneath the average square kilometer.[38] But in Africa, for instance, only around $25,000 of known sub-soil assets lie beneath the average square kilometer. This huge disparity is not due to fundamental differences in geology; it is likely that Africa has more, not less, assets than advanced economies that have been extracting resources for two centuries. But to date, there has been only limited international investment in prospecting in Africa. Many of Africa's resources await discovery.

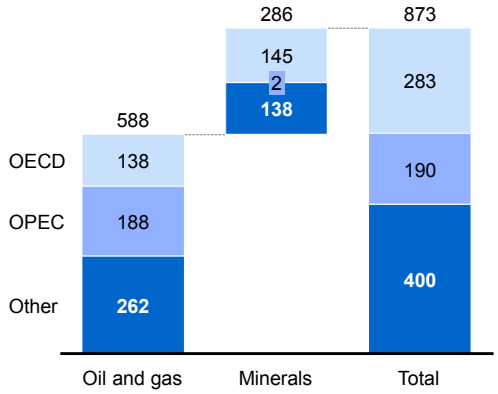
37 The most widely used international standard definition of the poverty line is income of $1.25 a day at PPP. Based on most recent poverty head-count data available for countries between 2005 and 2011.

38 Paul Collier, *The plundered planet: Why we must—and how we can—manage nature for global prosperity*, Oxford University Press, 2011.

Exhibit 6

About half of natural resource reserves are in non-OECD, non-OPEC countries

Total oil and gas and mineral[1] resources by country[2]
$ trillion, at 2012 Brent and commodity prices



1 Includes reserves of iron ore, coal, copper, gold, nickel, silver, potash, and phosphate rock.
2 Two resource-driven countries (New Caledonia and Northern Mariana Islands) are excluded due to lack of data.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute analysis

This history of underexploration in non-OECD and non-OPEC markets is changing. Rising resource prices have already been the catalyst for significant investment in exploration in new regions that could support future production. Oil and gas exploration in southern and eastern Africa, for example, has increased from just over $1 per square kilometer in 2000 to an average of more than $7,000 per square kilometer over the past five years—and more than $31,500 per square kilometer in 2012. This is still significantly lower than the levels of exploration in OECD countries but is a significant increase nonetheless. Non-ferrous mineral exploration in Africa has also increased substantially, from less than $17 per square kilometer in 2000 to $189 per square kilometer in 2012. Increasingly, discoveries are being made in new areas. While southern and eastern Africa accounted for less than 0.5 percent of oil and gas discoveries at the turn of the century, these regions accounted for an average of almost 13 percent of new discoveries over the past three years and more than 25 percent in 2012.[39] And the geographical spread of production could potentially widen as a result. The IMF reports that 12 countries have identified reserves and the potential to become resource exporters, though their production has not begun or reached significant levels.[40]

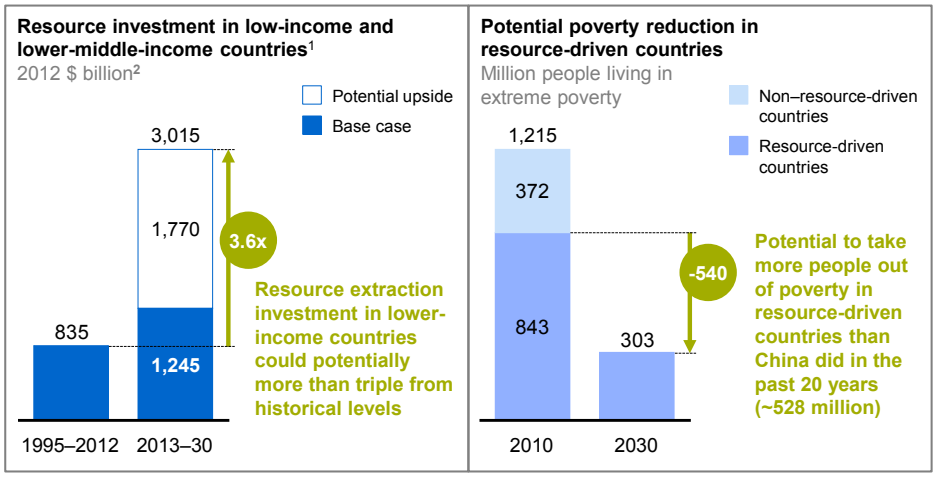
39 UCube database, Rystad Energy.

40 The 12 economies identified are Afghanistan, Central African Republic, Ghana, Guatemala, Kyrgyz Republic, Madagascar, Mozambique, São Tomé and Principe, Sierra Leone, Tanzania, Togo, and Uganda. See *Macroeconomic policy frameworks for resource-rich developing countries*, IMF, August 2012.

If governments in low-income and lower-middle-income countries use their endowments appropriately and develop effective collaboration with extraction companies, they can potentially transform their economies and the lives of their citizens. As we have said, it isn't easy to estimate the economic potential because exploration in many of these countries to date has been so limited, but how large could the prize be? Based on a range of methodologies, including estimates of industry experts, announced projects, and equalization of investment per square kilometer (excluding OPEC countries), there is a potential $1.2 trillion to $3 trillion of cumulative resource investment available to 2030 in low- and lower-middle-income countries (Exhibit 7).[41] To put this into context, in the high case, annually this is more than three times the 2011 development aid flows to these countries. The wise development and use of resource reserves could lead to significant alleviation of poverty in these countries. If all resource-driven countries were to match the record of the most successful resource economies in reducing poverty, there is potential to lift 540 million people in all these economies out of poverty by 2030.[42] That is more than the number of people who left poverty in China over the past 20 years.

Exhibit 7

Investment in resource extraction could trigger economic and social transformation in lower-income countries over the next two decades



1 As defined by the World Bank on the basis of per capita GNI in 2011. Investment includes oil and gas and minerals.
2 This represents the share of the total global cumulative investment to 2030 (up to $17 trillion in total) that could be focused on low-income and lower-middle-income countries. See the appendix for further details on the methodology.
NOTE: We have not shown poverty statistics for non–resource-driven countries to 2030.
SOURCE: McKinsey Energy Insights; McKinsey Basic Materials Institute; Wood Mackenzie; Rystad Energy; IHS Global Insight; World Bank; McKinsey Global Institute analysis

41 Further details on the methodology can be found in the appendix.

42 Further details on the methodology can be found in the appendix.

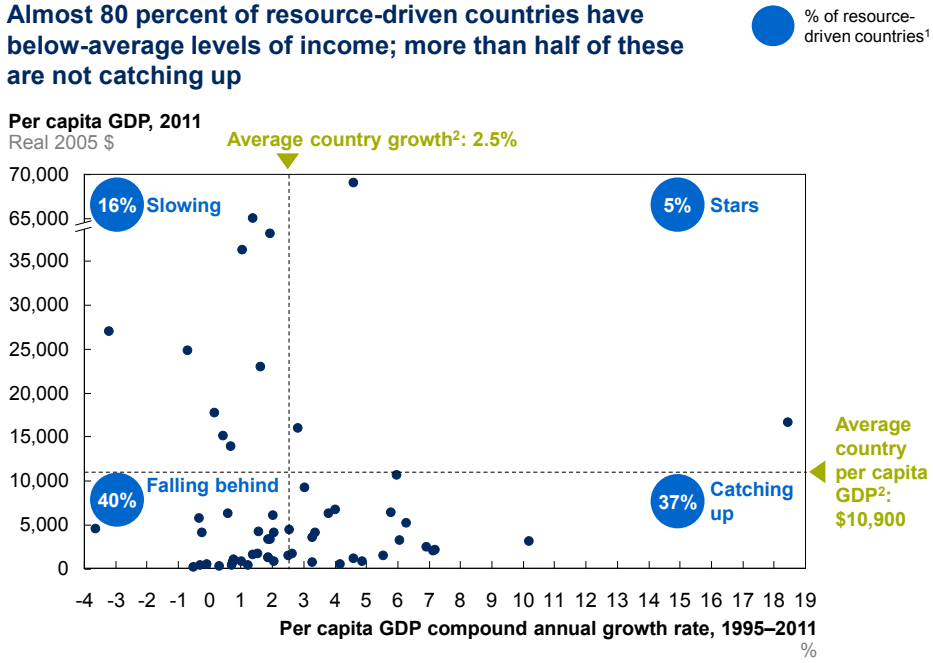
Capturing this potential will require a break from the historical economic development model

There is no guarantee that resource-driven countries can capture the benefits of their endowments and convert them into an improvement in the broad performance of their economies. The limited availability of data and the lack of a suitable control group for the purposes of comparison make it difficult to compare the economic performance of resource-driven countries. However, the available evidence suggests that resource-driven countries have tended to underperform the economies of countries that do not rely on resources to the same extent.[43]

Almost 80 percent of countries whose economies have historically been driven by resources have below-average levels of per capita income, and more than half of these are not catching up (Exhibit 8). Only 5 percent of them have outpaced the global pace of average incomes, and these economies had a higher starting point. While data are more limited across our sample of resource-driven countries before 1995, the statistics that are available suggest that the underperformance on economic growth was even more marked in that period.[44] Between 1980 and 2011, 70 percent of resource-driven countries for which data are available increased their average incomes at a slower rate than the global average.

Exhibit 8

Almost 80 percent of resource-driven countries have below-average levels of income; more than half of these are not catching up



1 Considers 58 countries that were resource-driven in 1995. Four countries were excluded due to lack of data.
2 Unweighted average of the growth in per capita GDP of all countries.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute analysis

43 A further complication with this comparative economic analysis is that many countries in our sample became "resource-driven" at different times. For simplicity, we have included in this analysis only countries that were resource-driven in 1995. The main conclusions we draw here do not change when we include all resource-driven countries in the analysis.

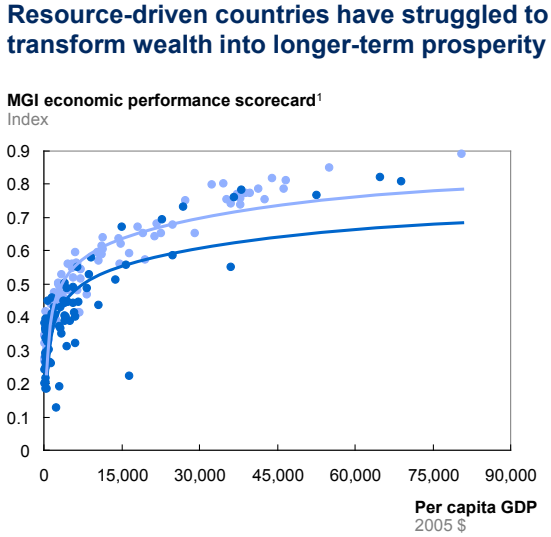
44 Data are not available for 12 of the 58 countries that were resource-driven in 1995.

Over the past decade, we have seen strengthening improvement in the economic performance of resource-driven countries. For example, between 2000 and 2011, Equatorial Guinea was the world's fastest-growing economy, with output growth averaging 17 percent per annum.[45] Between 2000 and 2011, resource-driven countries increased average incomes faster than their non-resource-driven counterparts. Countries that were resource-driven at the turn of the century increased their real per capita GDP at an annual rate of 3.8 percent to 2011, compared with 2.7 percent for other countries.

Even when resource-driven economies have sustained above-average economic growth over the long term, they have not necessarily enhanced prosperity in the broader sense, as measured by MGI's economic performance scorecard.[46] On average, resource-driven countries score almost one-quarter lower than non-resource-driven countries on the scorecard and even lower when they are at similar levels of per capita GDP (Exhibit 9). In Zambia, for example, poverty levels increased from 2002 to 2010 despite strong economic growth.[47]

Exhibit 9

Resource-driven countries have struggled to transform wealth into longer-term prosperity



Average economic performance score by income bracket
$ per capita

	Resource-driven[2]	Not resource-driven
0–1,000	0.24	0.28
1,000–3,000	0.31	0.41
3,000–5,000	0.36	0.46
5,000–10,000	0.42	0.51
10,000–20,000	0.46	0.64
20,000–40,000	0.73	0.78
40,000+	0.88	0.90

1 MGI index is based on metrics covering productivity, inclusiveness, resilience, connectivity, and agility.
2 Includes six future resource-driven countries.
NOTE: Three resource-driven countries have been excluded due to lack of data.
SOURCE: McKinsey Global Institute analysis

45 *Equity in extractives: Stewarding Africa's natural resources for all*, Africa progress report 2013, Africa Progress Panel, May 2013.

46 The MGI economic performance scorecard measures economic progress across five dimensions: productivity, inclusiveness, resilience, agility, and connectivity. See the appendix for further details on the methodology and the specific metrics used to assess performance.

47 PovcalNet, http://iresearch.worldbank.org/PovcalNet/index.htm.

Resource-driven countries vary significantly across the following five dimensions of the scorecard:

- **Productivity.** Productivity refers to the extent to which an economy uses labor, capital, and natural resources efficiently. This varies considerably among resource-driven countries. Labor productivity estimates in these countries can often be biased upward due to the presence of the resources sector, which contributes significant value added but employs few workers. Looking at longer-term productivity trends, we find that few resource-driven countries have maintained productivity growth over sustained periods. For example, although Australia's income grew by 4.1 percent per annum between 2005 and 2011, multi-factor productivity declined by 0.7 percent a year, indicating that the growth was largely driven by more temporary factors connected to the resources boom, such as improvements in the terms of trade and capital investment, rather than fundamental productivity improvements.[48] Resource-driven countries are also often very inefficient domestic users of natural resources due to the presence of significant subsidies.

- **Inclusiveness.** Growth can be shared unevenly among regions, income groups, and age groups. Managing large resource windfalls can create significant challenges for inclusive growth, including meeting societal expectations about what constitutes a "fair" distribution of resource benefits. The academic evidence on the links between resource booms and income inequality is inconclusive.[49] On the one hand, income equality could potentially be reduced (at least in the short term) by an increase in public-sector employment as well as the arrival of new jobs and investment. On the other hand, income equality could be worsened if a resources boom crowds out the growth of more labor-intensive manufacturing and agriculture sectors (assuming limits on inter-sector labor mobility), or if it leads to weak institutional development, fueling corruption. However, some resource-driven countries, including Australia, Norway, and Iceland, all have low levels of perceived corruption, low wage inequality, and high levels of participation in the labor force that enable citizens to benefit from economic growth through jobs. Resource wealth can also potentially shrink employment opportunities for women because manufacturing, which provides many jobs for female workers, is harmed by exchange-rate appreciation and higher domestic costs.[50]

- **Resilience.** The extent to which an economy can mitigate future risks to growth depends on a host of factors, including demographic changes, debt, over-reliance on a small number of sectors, and capital depletion. By definition, resource-driven countries are more likely to be disproportionately dependent on their energy and mineral sectors. Resource rents accounted for more than 40 percent of GDP in 14 resource-driven countries in 2010. Resource booms can diminish an economy's diversification due to Dutch disease concerns and can make it more susceptible to the effects of volatility in resource prices and spending.

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48 *Beyond the boom: Australia's productivity imperative*, McKinsey Global Institute, August 2012.

49 For a useful summary of the empirical and theoretical literature in this area, see Michael L. Ross, "How mineral-rich states can reduce inequality," in *Escaping the resource curse,* Macartan Humphreys, Jeffrey D. Sachs, and Joseph E. Stiglitz, eds., Columbia University Press, 2007.

50 Michael L. Ross, *The oil curse: How petroleum wealth shapes the development of nations*, Princeton University Press, 2012.

- **Agility.** Agility is the ability of a country to innovate and find new growth engines through developing human capital, boosting the efficiency of the private sector, and ensuring that the physical and information infrastructure is in place to support growth. Resource-driven economies vary widely on this front. Israel's public and private research and development expenditure totaled 4.4 percent of GDP in 2011, the highest of any country, while Gambia spent close to zero on R&D. Five resource-driven countries have successfully reduced the time it takes to start a business to five days or less. However, six of the seven countries in the world where it takes longer than 100 days to start a business are resource-driven.

- **Connectivity.** Finally, connectivity is the ability to take full advantage of opportunities beyond national borders through the transfer of goods, services, and skills. Resource-driven economies vary on this measure. These economies often attract high levels of foreign investment for the development of their resources sectors, and some have benefited from the transfer of skills. In Qatar, for example, international migrants made up 74 percent of the population in 2010 and have contributed a great deal to the development of the country's oil sector. However, other economies have significant regulatory barriers to connectivity. For example, while Kazakhstan's resource exports accounted for more than 35 percent of GDP in 2011, the country still placed 182 out of 185 countries on the rankings for trading across borders produced by the World Bank and International Financial Corporation.[51]

There is also doubt about whether the quicker economic growth we have seen in some resource-driven countries will prove sustainable. A large body of evidence suggests that, while resource-driven economies benefit in the short term after a resource discovery or boom in production, these gains do not necessarily lead to an increase in the overall economic performance of these countries over the longer term (see Box 2, "Academic debate about the resource curse"). Put bluntly, too often an abundance of resources has not enhanced economic development but impeded it.

There are three broad reasons for this, the first of which has been a failure to develop resource endowments effectively. Many countries have put in place inappropriate fiscal regimes and have struggled to develop competitive resources sectors by addressing non-geological costs such as infrastructure bottlenecks and dealing with country-risk issues that can deter investors. In some cases, resentment over the perceived failure to capture an appropriate share of resource rents has led to nationalization, which has often precipitated a fall in foreign investment and a severe economic downturn. Venezuela, for example, nationalized its oil and gas industry in 2001, resulting in weak growth in the resources sector and the economy as a whole. Net foreign direct investment (FDI) fell from 7.2 percent of GDP in 1997 to 0.1 percent in 2006.

The second reason is that countries have often failed to spend the resource windfall wisely. They have not managed macroeconomic instability and corruption and have struggled to ensure that their resource wealth is used for productive long-term investment that creates clear benefits for a large share of the population. Since the turn of the century, the average annual price volatility of

51 *Doing business 2013: Smarter regulations for small and medium-size enterprises*, World Bank and International Financial Corporation, 2012.

energy and metals is more than double that experienced in the 1990s.[52] Volatility in commodity prices can result in overspending during booms and excessive borrowing during busts, destabilizing the public sector as a whole. Zambia's government banked on booming copper revenue in the 1970s to construct an extensive welfare state, which had to be dismantled when prices later fell. Flush with resources revenue, many governments also spend wastefully, creating bloated public sectors and "white elephant" public-investment projects.

Third, there has been a failure to develop sectors beyond resources. Exchange-rate appreciation and domestic cost inflation linked to resource-led export booms make other export sectors, such as manufacturing, less competitive in global markets. This reduces both the demand for and the supply of skilled labor, leading to greater income inequality and potentially curbing productivity growth. These effects have been dubbed Dutch disease, an expression coined by *The Economist* in 1977 to describe the aftermath of a natural gas boom in the Netherlands. Compounding these Dutch disease concerns has been a failure to develop robust institutions that can support economic growth. A reliance on resource rents limits incentives for governments to build robust and efficient domestic institutions and bureaucracies. Democratic participation can be undermined if states use their authority to allocate and redistribute resource rents to exert social and political control. In extreme cases, struggles to control these rents can lead to government instability and civil war. Global statistical evidence shows that the risk of civil war is increased by revenue from resource extraction (even after controlling for the rate of economic growth).[53] Poor political institutions, corruption, and resource wealth concentrated in the hands of a few can set the stage for deteriorating political institutions and conflict.

□ □ □

The emergence of more than 1.8 billion additional middle-class consumers will continue to fuel growth in demand for natural resources to 2030—a period that will also require the discovery and development of new sources of supply. This offers resource-driven economies the chance to transform their prospects in the years ahead. But the past offers a warning. All too often, even large resources revenue has failed to support longer-term social and economic development, and even undermined it. Breaking from the past will require resource-driven countries to rethink their approaches. In Chapter 2, we explore the important decisions that policy makers in resource-driven countries will need to make in order to turn their resource endowments into a blessing rather than a curse.

52 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

53 See, for example, Paul Collier, Anke Hoeffler, and Dominic Rohner, "Beyond greed and grievance: Feasibility and civil war," *Oxford Economic Papers*, volume 61, issue 1, January 2009.

Box 2. Academic debate about the resource curse

Are natural resources a "curse" or a "blessing"? The empirical evidence suggests either is possible.[1] Many empirical studies show that resource-rich economies appear to grow more slowly than other economies. Studies by Jeffrey Sachs and Andrew Warner confirmed a number of previous analyses.[2] This body of academic work argues that, although short-term economic effects from developing resources are often positive, there is also a broad range of issues that can slow long-term growth and negatively affect broad-based prosperity, including appreciation of the real exchange rate, macroeconomic volatility from resource price movements, deindustrialization, deterioration in governance, and increased corruption.[3] Other papers provide within-country evidence for governance concerns associated with natural resources. For example, Francesco Caselli and Guy Michaels show that higher oil output among Brazilian municipalities appears to be associated with increased instances of illegal activities by local officials.[4]

However, other economists have produced evidence contrary to the traditional story of the resource curse. Using proxies for natural resource endowments different from those used in past studies and adjusting for other econometric issues, economists have found little evidence of a resource curse.[5] Other recent academic work has also challenged the idea that increases in resource reliance are associated with authoritarianism.[6] Some have questioned the underpinnings of some of the channels through which the resource curse was assumed to operate. For example, in light of recent movements in commodity prices, some have expressed doubt about the long-standing argument by Raul Prebisch in his 1959 analysis that the terms of trade for countries that export resources decline over time compared with exporters of manufactured goods.[7] Others have questioned the idea that long-term productivity growth is necessarily slower in the resources sector than in other sectors such as manufacturing. For example, in 2004 Erling Røed Larsen argued that "Norwegian oil is a high technology sector which we may assume has much the same positive spillover effects as manufacturing is supposed to have."[8]

So how can we reconcile all of this seemingly contradictory evidence? Perhaps Michael Ross best bridges the different perspectives on these issues when he argues that the resource curse is rather more subtle than much of the literature has suggested, and that the simple truth is that resource-rich economies ought to be growing more quickly than they are.[9]

1 For a recent review of the academic literature, see Frederick van der Ploeg, "Natural resources: Curse or blessing?" *Journal of Economic Literature*, volume 49, number 2, 2011.

2 Jeffrey D. Sachs and Andrew M. Warner, "Natural resource abundance and economic growth," in *Leading issues in economic development*, G. Meier and J. Rauch, eds., Oxford University Press, 1995 and revised 1997; Alan Gelb et al., *Oil windfalls: Blessing or curse?* World Bank Research, 1988; Richard Auty, *Sustaining development in mineral economies: The resource curse thesis*, Routledge, 1993; D. Wheeler, "Sources of stagnation in sub-Saharan Africa," *World Development*, volume 1, issue 1, January 1984; W. M. Corden, "Booming sector and Dutch disease economics: Survey and consolidation," Oxford Economic Papers, volume 36, number 3, 1984.

3 Paul Collier and Benedikt Goderis, *Commodity prices, growth, and the natural resource curse: Reconciling a conundrum*, Economic Series working paper 2007–15, 2008; Punam Chuhan-Pole et al., *Africa's pulse: An analysis of issues shaping Africa's economic future*, World Bank, 2013; Paul Collier and Anke Hoeffler, "Resource rents, governance and conflict," *Journal of Conflict Resolution*, volume 49, number 4, August 2005; Paul Collier and Anke Hoeffler, "Testing the neocon agenda: Democracy in resource-rich societies," *European Economic Review*, volume 53, issue 3, April 2009.

4 Francesco Caselli and Guy Michaels, "Do oil windfalls improve living standards? Evidence from Brazil," *American Economic Journal: Applied Economics*, volume 5, number 1, January 2013.

5 For a review of this contrary evidence, see Daniel Lederman and William F. Maloney, "In search of the missing resource curse," *Journal of LACEA Economia*, volume 9, number 1, fall 2008.

6 Stephen Haber and Victor Menaldo, "Do natural resources fuel authoritarianism? A reappraisal of the resource curse," *American Political Science Review*, volume 105, number 1, 2011. This work has been challenged by Michael L. Ross and Jørgen Juel Andersen, "The Big Oil change: A closer look at the Haber-Menaldo analysis," presented at annual meeting of American Political Science Association in New Orleans, August 30–September 2, 2012.

7 Raul Prebisch, "The economic development of Latin America and its principal problems," *Economic Bulletin for Latin America*, volume 7, number 1, 1962; John T Cuddington et al., "Prebisch-Singer redux," in *Natural resources: Neither curse nor destiny*, Daniel Lederman and William F. Maloney, eds., World Bank, Stanford University Press, 2007.

8 Erling Røed Larsen, *Escaping the resource curse and the Dutch disease? When and why Norway caught up with and forged ahead of its neighbors*, discussion paper number 377, Research Department, Statistics Norway, May 2004.

9 Michael L. Ross, *The oil curse: How petroleum wealth shapes the development of nations*, Princeton University Press, 2012.

2. Turning natural resources wealth into long-term prosperity

Creating value for both resource-driven countries and the extractive companies operating in them requires tailoring approaches to the specific context of the resource-driven country. Unfortunately, past analyses have tended to offer one-size-fits-all recommendations that ignore the fact that resource-driven countries are a highly disparate group that ranges from largely agrarian economies such as Mali and Myanmar, which have not developed their resources to any great extent, to prosperous and mature economies like Australia and Canada that have broadly diversified beyond natural resources.

Success will require a sophisticated understanding of the starting point of each country. We need to move beyond the conceptual analysis on which much of the current literature on resource-driven economies relies to more practical advice that can help inform action by governments and extractive companies. The contentious issue of local content is a case in point. Most of the existing literature acknowledges that not all elements of the resources value chain are amenable to local content in certain countries, but none has estimated what share is amenable and under what conditions. Our work considers the entire resources value chain from exploration through to sector diversification, our aim being to build a fact base on the common issues facing resource-driven countries and, where possible, to identify specific lessons on which approaches work and which do not.

While some resource-driven countries have become enamored with the idea of pursuing the Asian Tiger approach to economic development—developing a strong manufacturing sector and moving up the value chain to produce more sophisticated products over time—we find that this model, or indeed any single “one-size-fits-all” model, fails to reflect the unique circumstances of each economy. Resource-driven countries need a new growth model to transform today’s potential resource windfall into long-term prosperity. In this chapter, we lay out such a model (which we dub the “Resource Tiger” approach), drawing on the many successful approaches that some resource-driven countries have employed. It has six core elements (which must be tailored to the individual country context): building the institutions and governance of the resources sector; developing infrastructure; ensuring robust fiscal policy and competitiveness; supporting local content; deciding how to spend a resources windfall wisely; and transforming resource wealth into broader economic development. We develop an index, based on currently available data, to measure how resource-driven countries are performing in each of these six areas.

Resource-driven countries need a tailored economic strategy that addresses three key areas

It is difficult to find appropriate measures to assess the performance of countries in each of the three strategic areas we highlight and the six more specific elements that belong to them. However, we have used the best available proxies to identify the ten countries that have performed the most effectively in each area (Exhibit 10).[54] Some interesting findings emerge. For instance, only three countries—Australia, Canada, and Norway—are among the top ten on all six. This suggests that there are large opportunities for improvement for all countries across the resource value chain and that those seeking to achieve best practice should look at a broad range of countries for examples. Even among these leading countries, we find significant opportunities to improve performance. Throughout this report, we refer to examples of best practice from the top-performing countries identified in this exhibit, as well as other relevant examples.

Exhibit 10

Countries performing well across the six areas of the resources value chain

	Develop resources		Capture value		Transform value into long-term development	
	Institutions and governance	**Infrastructure**	**Fiscal policy and competitiveness[1]**	**Local content development**	**Spending the windfall**	**Economic development**
1	Norway	Canada	Canada	Canada	Norway	Norway
2	Canada	Malaysia	Chile	Norway	Australia	Qatar
3	Australia	Norway	Norway	Qatar	Canada	Australia
4	UAE[2]	Australia	Botswana	UAE[2]	Bahrain	Iceland
5	Chile	Lithuania	Mexico	Australia	Brazil	Canada
6	Iceland	Saudi Arabia	Australia	Iceland	Kuwait	UAE[2]
7	Qatar	Namibia	Bulgaria	Malaysia	Botswana	Israel
8	Brunei Darussalam	UAE[2]	Peru	South Africa	Colombia	Bahrain
9	Oman	Iceland	Brazil	Lithuania	Chile	Brunei Darussalam
10	Brazil	Azerbaijan	Colombia	Guatemala	South Africa	Chile

1 Analysis restricted to mining sectors due to data availability and comparability issues. The analysis is based on country risk, access to skills, regulatory duplication, and taxation. The assessment excludes other aspects of competitiveness, such as energy and wage costs, and other regulatory barriers.
2 United Arab Emirates.
NOTE: Based on a variety of publicly available sources of information. See the appendix for further details on the methodology.
SOURCE: Revenue Watch; World Economic Forum; World Bank; United Nations Educational, Scientific and Cultural Organization; UN Human Development Report; Yale Environmental Performance Index; Fraser Institute; Morningstar; International Monetary Fund; International Budget Partnership; McKinsey Global Institute analysis

54 See the appendix for further details on the methodology.

Institutions and governance of the resources sector

We have identified five distinct archetypes of state intervention in the resources sector, which range from the state having a non-operational role to a government monopoly. Each of these models can be successful in developing the resources sector and in achieving broader economic development; conversely, no model guarantees success. Picking the model that best suits the country's context is important, of course, but what matters most is effectively implementing and managing the chosen model. In this section, we dispel some popular myths about the intrinsic advantages of particular models of participation and argue for a shift in the discussion from ideology to execution, with a focus on the key factors required for the successful production of resources.

THERE ARE FIVE TYPES OF STATE PARTICIPATION IN RESOURCES SECTORS

The popularity of state participation varies across resources and has evolved over time. In the oil and gas sector, a small number of privately owned companies nicknamed the "seven sisters" dominated oil production for much of the early to mid-20th century. The ownership landscape changed significantly in the 1960s and 1970s as various developing countries established national oil companies, often through the nationalization of private-sector assets. These include Angola's Sonangol, Saudi Aramco, Nigeria's NNPC, Malaysia's Petronas, and the Kuwait Oil Company.[55] The speed of this transformation was remarkable. In 1970, international oil companies had access to 85 percent of the world's oil reserves. By 1980, national oil companies could access 59 percent. During the 1990s, state control of oil production reduced somewhat as economic liberalization thinking took hold. For instance, Argentina privatized the energy company YPF in 1992, and Russia sold off much of its former national oil companies to private investors. Since the turn of the century, state ownership levels have increased only slightly.

In mining, state ownership has followed similar trends. Prior to the 1960s, state ownership was largely confined to centrally planned economies such as the Soviet Union and Eastern European countries as well as some Scandinavian countries. Finland's state-owned Outokumpu, founded before the Second World War, and the Swedish government's full acquisition of LKAB in 1956 are two examples from Scandinavia.[56] In the 1960s and 1970s, state ownership levels increased significantly as about 80 foreign mining companies had their assets expropriated by various developing countries, many of them former colonies in the early days of their independence. State ownership continued to rise in the mining industry, reaching 46 percent of the value of metal production (at the mining stage) in 1984.

55 David G. Victor, David R. Hults, and Mark Thurber, eds., *Oil and governance: State-owned enterprises and the world energy supply*, Cambridge University Press, 2012.

56 *Overview of state ownership in the global minerals industry: Long-term trends and future*, Raw Materials Group for the World Bank, 2011.

State ownership levels then fell significantly from the late 1980s onward to just 22 percent of global metals production, due to the collapse of the Soviet Union, a changing political emphasis in Western countries on free markets, falling metal prices, and concerns about the efficiency of state-owned enterprises (SOEs). However, the growth of Chinese companies domestically and internationally has led to the re-emergence of state-ownership in mining production since the turn of the century. By 2008 state ownership models were used in about 28 percent of global metals production.[57]

We have identified the following five archetypes of state intervention in the production of oil and gas, and minerals:[58]

- **No state ownership.** The state does not have direct involvement in the industry but receives taxes and/or royalties. Examples include Australia and Canada.

- **Minority investor.** The state has a minority stake in a company but does not play an active role in its management or direction, beyond its role as investor. In other words, it has no significant influence on operations. One example is Thailand's stake in PTTEP.

- **Majority-owned with limited operatorship.** The state has a majority stake in a company and plays a role in the company's management. However, less than 10 percent of the country's production is operated by the state, or the state exclusively operates in certain segments such as onshore oil. Examples include Nigeria's NNPC, Angola's Sonangol, and India's Hindustan Copper.

- **Majority-owned operator.** These companies are majority or fully owned by the state, and more than 10 percent of the country's production is operated by the state company. Examples include Norway's Statoil and Debswana in Botswana.

- **Government monopolist.** The company is fully owned by the state. The company accounts for more than 80 percent of total country production (operated or non-operated). Examples include Pemex of Mexico and Saudi Arabia's Saudi Aramco.

The popularity of each varies according to the resource. Today, more than half of oil and gas producers in our database, representing almost three-quarters of world production, are fully or majority state-owned (Exhibit 11). In contrast, governments have majority- or fully owned state companies in only about 24 and 20 percent of countries with iron ore and copper resources, respectively, accounting for 35 and 43 percent of production in each case.

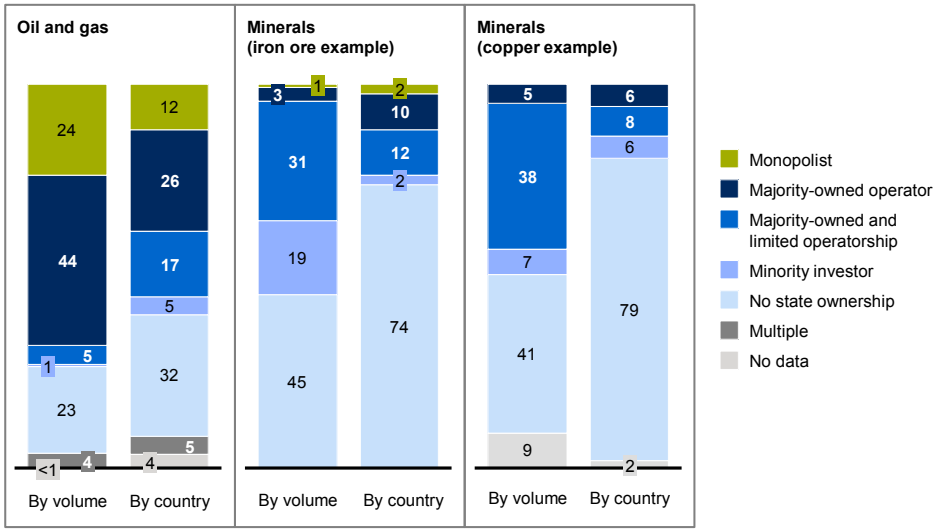
57 Ibid.

58 In some cases, countries have a mix of archetypes. For example, Norway combines a majority-owned operator (Statoil) with a minority investor (e.g., Petoro). In other cases, the operator may display characteristics from multiple archetypes, For example, the Brazilian government has considerable influence over Vale (despite being a minority investor) due to "golden shares" that give the government veto power over certain decisions such as changing the location of the company's headquarters or its corporate focus.

Exhibit 11

State ownership is much more common in the oil and gas sector than in the minerals sector

2012; %



NOTE: Numbers may not sum due to rounding.
SOURCE: Raw Materials Group; Rystad Energy; McKinsey Global Institute analysis

NO SINGLE MODEL OF STATE PARTICIPATION GUARANTEES THE MOST EFFECTIVE DEVELOPMENT OF RESOURCES

Assessing the merits of different state participation models is difficult for two reasons. First, states often have different objectives for their chosen model of participation, which makes an objective definition of "success" difficult. They commonly cite four reasons to support their decision to intervene—or not—in the production of resources: maximizing the development of national resources; capturing a greater share of value from the resources sector locally; pursuing a more equitable distribution of resource benefits across the population; and increasing state control over national resources for political or ideological reasons.[59] Second, measuring success against any of these four objectives is difficult because there are many uncontrollable factors that affect the success of a resources sector, including the quality of the country's resources, global demand trends, and a country's broader economic and institutional context. Notwithstanding these difficulties, we believe there are three widely held misconceptions about state participation models.

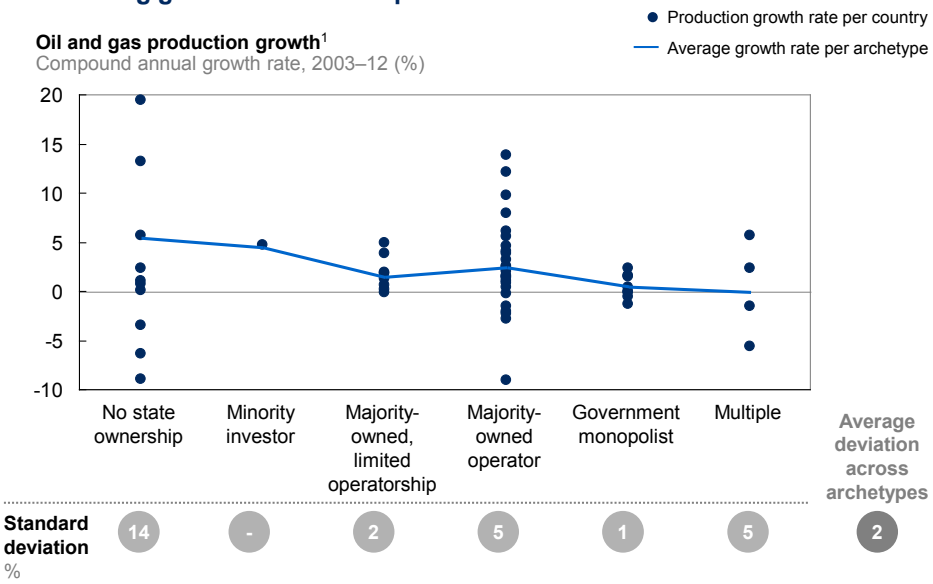
59 Based on a literature search of statements by policy makers in 16 resource-driven countries.

Myth 1: Less state participation leads to better production of resources

We find that all participation models can be successful. To illustrate this, we use production growth rates as an imperfect proxy for success in maximizing the development of national resources.[60] Looking at oil and gas operators, we find that the variation in the production growth of operators (measured in terms of standard deviation) within each model is almost three times as great as the deviation across models (Exhibit 12). In short, the data suggest that it is not what model you pick but how you execute it that matters for performance. Variation is highest in countries with no state ownership and in countries with majority-owned operators, but we should note that there are many more examples of these two models than of the others.

Exhibit 12

No one model of state participation has clearly outperformed others in achieving growth in resource production



1 Includes only countries producing more than 100 kilo-barrels of oil equivalent per day.
SOURCE: Rystad Energy; McKinsey Global Institute analysis

Yet we also find that no model guarantees success. For example, neither Mexico nor Indonesia has state ownership in its copper sector. Copper production in Mexico grew by 2.6 percent per annum between 2005 and 2012, while Indonesia's declined by 12 percent a year over the same period. State-owned companies have also experienced varying degrees of success. Saudi Aramco, a government monopolist, is widely acknowledged to be one of the world's leading state-owned oil companies.[61] It has helped Saudi Arabia to achieve 2.4 percent annual growth in its oil production over the past ten years despite having relatively mature assets. In contrast, even though Mexico is a relatively competitive economy and has a stable political system, Pemex has presided over a 20 percent decline in production over the past eight years.

60 Production growth rates are a crude proxy because they are affected by many factors other than the choice of state participation model, including global demand, quality of the resource, and maturity of the sector.

61 See, for example, the rankings of state-owned enterprises in *Oil and governance: State-owned enterprises and the world energy supply*, David G. Victor, David R. Hults, and Mark Thurber, eds., Cambridge University Press, 2012.

A variation of this argument contends that international resource companies are always more efficient than those that are state-owned. Exogenous factors such as the quality of resource assets make cross-company comparisons difficult. While some studies have found that, in general, national oil companies are less efficient than private companies, some of these nationally owned companies perform as well as, or better than, their private counterparts.[62] Wolf, for example, finds that while non-OPEC national oil companies tend to be less labor- and capital-efficient than the private sector, OPEC national oil companies often outperform some private-sector firms in terms of their capital and labor efficiency.[63]

Myth 2: State equity always delivers greater local benefits

To the contrary, we find that there is not necessarily a clear link between state equity and the share of value captured locally. South Africa captured 89 percent of mining value locally despite not having significant levels of state ownership.[64] In some cases, the capital needed for the state to participate in the resources sector can divert capital from other areas that are important for broader economic development, such as housing, education, or even the infrastructure required to help the resources sector operate effectively. Some cross-country studies have shown that, in the oil and gas sector, additional gains through equity participation (beyond a non-operator role) are likely to be small, especially in countries with robust fiscal regimes.[65] Ensuring the right regulatory framework and establishing a supportive business environment through, for instance, local training centers, appear to be more important for ensuring local benefits.[66] That said, if done well, there are potential benefits of state-owned companies being able to balance broader societal concerns and the pursuit of profits. For example, Saudi Aramco has been active in the development of King Abdullah University of Science and Technology (KAUST) and various other education initiatives in Saudi Arabia.

Myth 3: The industry regulator should always be independent regardless of institutional context

The academic evidence clearly shows that resource-driven countries in which decision-making and executive bodies are accountable to the government and to the public, and in which resource companies have clear goals, roles, and responsibilities, are more likely to avoid the governance drivers of the resource curse.[67] However, there is also evidence that suggests that some countries with low skills may be better off combining the regulator with the national resource company—at least initially—if that state-owned company has significantly stronger technical expertise and skills than government administrative bodies.[68] In Angola, for example, the highly productive petroleum sector is driven by

62 Christian Wolf, "Does ownership matter? The performance and efficiency of state oil vs. private oil (1987–2006)," *Energy Policy*, volume 37, number 7, July 2009.

63 Ibid.

64 *Putting South Africa first*, Chamber of Mines of South Africa, November 2012.

65 Charles McPherson, *State participation in the natural resources sector: Evolution, issues and outlook*, paper prepared for IMF conference "Taxing Natural Resources: New Challenges, New Perspectives" in Washington, DC, September 25–27, 2008.

66 Local-content issues are discussed in further depth later in this chapter.

67 Macartan Humphreys, Jeffrey Sachs, and Joseph Stiglitz, eds., *Escaping the resource curse,* Columbia University Press, May 2007; Glada Lahn et al., *Report on good governance of the National Petroleum Sector*, Chatham House, April 2007.

68 Patrick Heller and Valérie Marcel, *Institutional design in low-capacity oil hotspots*, Revenue Watch Institute, August 2012.

the national oil company Sonangol, which manages, awards, and regulates the private concessions (together with the Ministry of Oil) and operates some of the blocks.[69] Of course, for this model to be successful it is crucial that the regulators maintain a level playing field and not favor the state-owned company on regulatory decisions.

COUNTRIES CAN BENEFIT FROM FOCUSING ON THE "HOW" RATHER THAN THE "WHAT"

All models of state participation can, if implemented well, lead to the successful development of resources sectors and help countries achieve broader objectives such as capturing local value and long-term energy security. While choosing a participation model suited to a country's institutions, capabilities, and capital availability is important, we think it is vital to shift focus from discussions about the "right" model to improved implementation of whichever model is chosen.

Regardless of the model, the following three guiding principles are critical:

- **Regulatory stability matters.** Governments need to establish a stable regulatory regime with robust rules to govern the sector, as well as clear roles for each player in the sector, and ensure that these rules are applied consistently. Minimizing regulatory uncertainty is critical to attracting private-sector investment. As highlighted earlier, expropriation of assets at non-market prices in Venezuela in 2001 led to a sharp fall in FDI.

- **Competitive pressure matters.** There is a clear link between competitive pressure and the performance of the resources sector. For example, the opening of the Chilean copper sector to competition led to significant improvements in the performance of Codelco, the government operator, with cost efficiency improving by 25 percent from 1993 to 1998. Significant domestic competition in Norway, combined with operations in more than 30 overseas markets, has helped Statoil become a high-performing oil company.

  Governments, regulators, and operators themselves need to ensure that government monopolists and majority-owned government operators give special attention to creating competitive pressure and independence of decision making for their state-owned companies. SOEs need a clear and consistent mandate and stable state governance, including independent and experienced boards, depoliticized management appointment processes, audits by independent accountants, and public disclosure of financial reports. They also need the power to make decisions to enable them to pursue objectives such as access to capital to fund investment that would allow national resource companies to create and implement long-term plans. Encouraging state-owned companies to compete overseas can be a useful mechanism to expose firms to competition. Petronas, for example, has interests in more than 30 countries. The company competes with oil and gas companies in other countries with a high degree of success; its international operations contributed roughly 40 percent of company income in 2008. This international profile creates strong incentives to improve operations.[70]

69 Mark Thurber, David Hults, and Patrick Heller, "Exporting the 'Norwegian Model': The effect of administrative design on oil sector performance," *Energy Policy,* 2011.

70 Leslie Lopez, "Petronas: Reconciling tensions between company and state," in *Oil and governance: State-owned enterprises and the world energy supply*, David G. Victor, David R. Hults, and Mark Thurber, eds., Cambridge University Press, 2012.

A final mechanism for ensuring competitive pressure is to allow state-owned companies to raise money on international debt markets, which brings a discipline to be efficient because of oversight from international investors. Statoil, PetroChina, Petronas, and Petrobras have all raised money in international markets.

- **Talent matters.** Finally, the ability to attract and retain world-class talent to state institutions is critical to the successful implementation of a state's chosen participation model, particularly if the state chooses to play a more operational role. Regardless of the model, all states need to build a strong regulatory capability. Licensing, regulating, and monitoring a resources sector require many specific skills, including ones related to geology, resource economics, and contracting, as well as an understanding of the particular characteristics of extractive industries such as capital intensity, long time frames, and high project risks. In building regulatory expertise for its civil servants in the 1960s, Norway organized study opportunities in leading petroleum research institutions in Britain and the Netherlands, among others, and engaged in extensive fact-finding missions to leading oil-producing regions including Texas and the Middle East.[71] Recognizing that it lacked the expertise it needed to oversee its resources sector, Angola's Sonangol sent students to overseas partners such as Eni, Sonatrach, and Petrobras to study, and provides scholarships for top performers on standardized tests.[72]

In addition to these three cross-cutting principles, countries should focus on the drivers of success that are specific to a particular participation model. While some of these can be shared across models, we highlight the following, which are particularly important for each archetype:

- **States with no ownership** need to have strong regulatory capabilities, including a robust tax regime and sophisticated contracting skills that allow them to capture value from the development of resources throughout commodity price cycles. Given that they have no equity stake, they need to be able to manage potential societal concerns that there is a lack of national ownership of the country's resources and be able to communicate clearly to citizens the benefits from adopting this intervention archetype.

- **Minority (state) investors** need to run their operations with a very lean organizational structure to minimize overhead costs but have highly skilled managers. One example of these characteristics is Norway's Petoro, which manages the country's portfolio of exploration and production licenses for petroleum and natural gas on the Norwegian continental shelf with fewer than 70 highly skilled permanent staff.

- **Majority state-owned companies with limited operatorship** should, in addition to the aspects that we have described for minority investors, focus on the acquisition of technology and expertise from operational partners.

- **Majority state-owned operators** should foster a commercial mindset in their day-to-day operations in three ways. First, they should have a clear focus on

71 Mark Thurber and Benedicte Istad, *Norway's evolving champion: Statoil and the politics of state enterprise*, Program on Energy and Sustainable Development, May 2010.

72 David G. Victor, David R. Hults, and Mark Thurber, eds., *Oil and governance: State-owned enterprises and the world energy supply*, Cambridge University Press, 2012.

delivering efficient and profitable operations and be careful of any potential conflict with broader national development goals allocated by the state. They therefore need to develop skills, expertise, and technology. Brazil's world-class research center CENPES helped to improve the operational performance of Petrobras and helped Brazil as a whole to achieve self-sufficiency in oil in 2006. Second, they need to be adequately funded to meet their own investment requirements, as opposed to the broader investment needs of government. For example, Saudi Aramco's corporate structure allows the company sufficient fiscal predictability to support the investment it needs.[73] In Mexico, by contrast, the government is heavily involved in Pemex's finances, prohibiting the company from retaining much of its earnings for investment; this has resulted in a large decline in oil production.[74] Finally, state-owned companies should aspire to best practice in corporate governance, including, where possible, the use of independent and experienced boards, depoliticized management appointments, and transparency in their performance to government owners and, if possible, to the public. Norway's Statoil has 11 board members, chosen by a corporate assembly elected partly by employees and partly by shareholders.

- **Government monopolists** should, in addition to heeding the lessons for operational partners and government operators, ensure that there are incentives or systems that promote competitive pressures. As we have discussed, performance benchmarking, raising funds from international capital markets, and competing overseas are potential ways to promote this pressure.

Infrastructure development

The availability and quality of infrastructure is important for resource-driven countries not only to enable them to develop their natural resources effectively but also to support their efforts to broaden and diversify economic growth. But the unfortunate fact is that, on average, resource-driven countries have lower-quality infrastructure than those that are not driven by resources.

Drawing on previous research by MGI and McKinsey's Infrastructure Practice, we estimate that resource-driven countries will require more than $1.3 trillion of infrastructure investment a year to 2030 to sustain their combined projected national GDP growth.[75] This is almost four times the amount these countries invested in infrastructure between 1995 and 2012. Given the size of the infrastructure needed, it is vital that these economies get the most out of this spending by being as productive and efficient as possible about the planning, delivery, and operation of infrastructure. In short, they need to boost infrastructure productivity. One practical way of "getting more for less" is to make better use of resource-related infrastructure by sharing it, helping to increase asset productivity.

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73 Paul Stevens, "Saudi Aramco: The jewel in the crown," in *Oil and governance: State-owned enterprises and the world energy supply*, David G. Victor, David R. Hults, and Mark Thurber, eds., Cambridge University Press, 2012.

74 Ognen Stojanovski, "Handcuffed: An assessment of Pemex's performance and strategy," in ibid.

75 *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute and the McKinsey Infrastructure Practice, January 2013. Our estimates include road, rail, port, airports, power, water, and telecommunications. See the appendix for further details.

RESOURCE-DRIVEN COUNTRIES HAVE POOR INFRASTRUCTURE

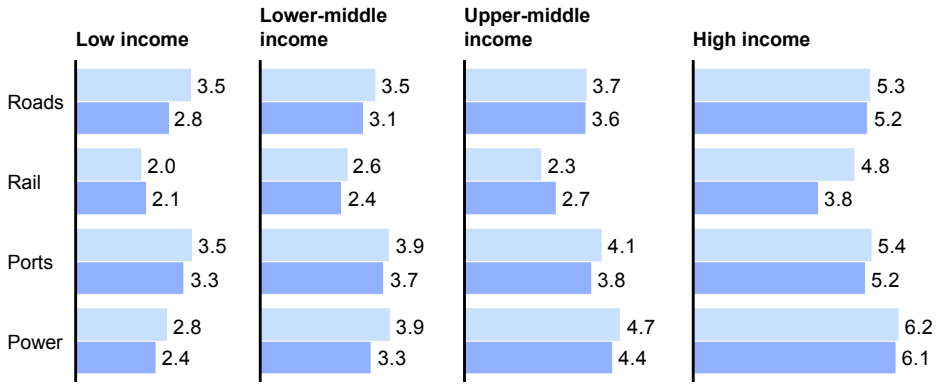
If we compare the main infrastructure classes between the two types of economies (across different levels of income), we find that, in all but two cases, resource-driven countries have lower-quality infrastructure (Exhibit 13). This poor record is likely to deter investment in both the resources sector and other sectors. A lack of adequate infrastructure has been a major hurdle to investment in African iron ore projects, for example. One analysis finds that 4,000 kilometers of railway would be needed to develop planned iron ore projects across Western and Central Africa at a total cost of more than $50 billion.[76] The Fraser Institute's survey of mining companies finds that more than 55 percent of investors considered weaknesses in infrastructure a deterrent to investment in 15 of the 58 countries covered.[77]

Exhibit 13

Resource-driven countries have worse infrastructure than other countries in all cases except for rail

Infrastructure quality ratings[1] by income classification[2]

1 = Extremely underdeveloped
7 = Extensive and efficient by international standards



1 Based on the World Economic Forum Global Competitiveness Report; 65 resource-driven countries included.
2 Classification based on World Bank income group definitions in 2011: low income is $1,025 or less; lower-middle income, $1,025–$4,035; upper-middle income, $4,036–$12,475; and high income, $12,476 or more.

SOURCE: World Economic Forum Global Competitiveness Report 2012; McKinsey Global Institute analysis

The history of underinvestment in infrastructure in resource-driven countries is particularly worrying because these countries are depleting their natural assets and often using the revenue from extraction in ways that do not lead to sustained wealth for their economies. They urgently need to use at least some of their resources revenue to build up the productive capital stock that can support further economic growth and help to bring down the cost of doing business.[78]

76 *Fostering the development of greenfield mining-related infrastructure through project financing*, International Finance Corporation, World Bank, April 2013.

77 The Fraser Institute's annual survey asks executives from hundreds of mining companies to "assess how mineral endowments and public policy factors […] affect exploration investment." One of the 20 issues analyzed is infrastructure quality.

78 Paul Collier and Sambit Bhattacharyya, "Public capital in resource-rich economies: Is there a curse?" *Oxford Economic Papers*, 2013.

RESOURCE-DRIVEN COUNTRIES COULD POTENTIALLY REDUCE INFRASTRUCTURE COSTS BY 40 PERCENT

Previous MGI research has identified three main levers that can help countries to boost their infrastructure productivity. MGI estimated that the same amount of infrastructure could be built for 40 percent less cost and considerably quicker.[79] We argue below that similar potential exists for resource-driven countries:

- **Improving project selection and optimizing infrastructure portfolios.** Choosing the right combination of projects is crucial. Too often, decision makers choose those that are not the most effective at meeting their countries' needs. To avoid such mistakes, policy makers should develop a credible infrastructure investment master plan that includes an assessment of what they need and where the money to pay for it will come from. Such plans need to use precise selection criteria, employ sophisticated methods to determine costs and benefits, and prioritize projects at a systemic level using transparent, fact-based decision making. In Chile, for example, the national Public Investment System evaluates all proposed projects using standard forms, procedures, and metrics, and it rejects as many as 35 percent of all proposals. The country has also developed a framework that enables private companies to propose and develop projects.

- **Streamlining delivery.** Building better and cheaper infrastructure more quickly is particularly important in resource-driven countries where capacity bottlenecks have often led to severe cost inflation and continue to do so. Governments and companies can both play their part. Governments need to facilitate private-sector participation in the finance, construction, and operation of infrastructure projects. Governments can speed up approval processes, develop the capabilities of the construction sector, structure public tenders to encourage cost saving, invest in high-quality project preparation, and build a suitably staffed ownership and oversight organization. Companies can take a more active approach to identifying projects and to early-stage planning and design, and build lean construction capabilities. Past McKinsey research in the extractive sector has identified opportunities to save as much as 25 percent on infrastructure costs by using such approaches.[80]

- **Making the most of existing infrastructure.** Countries should look at ways of boosting the use of their infrastructure assets by, for instance, ensuring that power plants do not suffer from shortages of energy inputs and lengthy and inefficient maintenance, and can therefore operate at full capacity; optimizing maintenance planning by taking a total cost of ownership approach; and expanding the use of demand-management measures. Sharing of infrastructure is a particularly promising tool for maximizing asset utilization in resource-driven countries.

79 *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute and the McKinsey Infrastructure Practice, January 2013.

80 *Beyond the boom: Australia's productivity imperative*, McKinsey Global Institute, August 2012.

THE $111 BILLION OF ANNUAL INFRASTRUCTURE INVESTMENT IN THE RESOURCE SECTOR IS A SIGNIFICANT OPPORTUNITY FOR SHARING

The infrastructure capacity and quality gaps in most resource-driven countries are of acute relevance to extractive companies, which are major investors and developers of infrastructure. Infrastructure tends to account for a substantial share of the entire capital spent on a resources project. Many projects, particularly in the mining industry, have very significant energy, water, and transport requirements. Nearly 40 percent of capital expenditure associated with bulk mineral-mining projects goes toward infrastructure, of which 80 percent is spent on the development of rail and ports. We have reviewed a large number of precious and base metal mining projects and find that around 10 percent of total capital expenditure goes toward power, water, and roads.[81] In newly opened resource regions in less developed countries, this share is likely to be even higher. While oil and gas developments are less infrastructure-intensive, they still have substantial needs, including ports and vast networks of pipelines.

The option of sharing infrastructure looks very attractive to both governments and extractive companies given the weight of infrastructure in overall capital spending and the capacity gaps in resource-driven countries that are making it difficult to develop infrastructure. Governments may be able to "piggyback" on large infrastructure investments by extractive companies, while extractive companies can share their infrastructure capital spending with others, thereby managing some of their capital exposure risk.

Sharing infrastructure can confer a number of potential advantages, including the following:

- **Maximizing infrastructure utilization and bringing down costs.** Sharing infrastructure has the potential to bring down overall infrastructure costs by increasing its use, but this benefit crucially depends on capacity. Because investment in infrastructure often accounts for the largest share of the costs of a resource project, infrastructure projects are commonly designed to maximize capacity. For these reasons, in many cases spare capacity may be limited.

- **Gaining access to private-sector capital and expertise.** For lower-income countries in particular, shared infrastructure is a potential way to access new sources of capital and, perhaps even more importantly, the project design and management skills that extractive companies have. Many developing countries lack the skills they need to plan, design, and manage projects on the scale that is typical in the resources sector. By collaborating through shared infrastructure, they have a better chance of seeing projects through to fruition and can also reap the benefits of knowledge and of technology transfer that develops the skills they lack.

81 Precious metal mining includes mines whose main product by value is gold, silver, or platinum. Base metal mining includes copper, zinc, and nickel. Bulk mining includes commodities such as iron ore and metallurgical and thermal coal.

- **Creating a strong bond between resource-driven countries and extractive companies.** It is important that host governments and extractive companies develop a symbiotic relationship, as we discuss in Chapter 3, and sharing infrastructure is one way of achieving this. One example of such a bond in practice is the South African eMalahleni water purification plant, in which Anglo American and BHP Billiton invested; the plant provides clean water to the communities around their mines. This project received a special mention from the United Nations Framework Convention on Climate Change Momentum for Change initiative at the COP17 meetings in Durban in 2011.

Infrastructure sharing can mean developing multi-user, multi-purpose infrastructure capacity such as a railway that carries passengers and non-resource goods as well as minerals, Gabon's SETRAG rail system being an example. Another model is several extractive companies sharing the same infrastructure—for example, two liquefied natural gas plants sharing an export terminal or two mining companies building a joint power plant. The World Bank has championed multi-purpose infrastructure to create development corridors, as we discuss later in this report.[82]

There has been little analysis of what share of the infrastructure that relates to extractive industries is potentially amenable to sharing, and we have tried to fill that gap in this report. We estimate that extractive companies are likely to account for almost 9 percent of the $1.3 trillion of annual infrastructure spending needed in resource-driven countries—that's about $111 billion a year. We find that a substantial proportion of this could be shared (Exhibit 14). The exact evaluation of the costs and benefits of sharing will be specific to the project and the country in which it is taking place. However, we find that, in general, rail and ports infrastructure for bulk materials is the least suitable for multi-user sharing, although it may sometimes be appropriate to share with other players in the industry. Power infrastructure is one of the best types for multi-user sharing, especially in cases where it can be plugged into a functioning national grid. Overall, we estimate that around $37 billion of investment in resource-related infrastructure in resource-driven countries is potentially amenable to multi-user sharing, while the remainder—$74 billion—could potentially be shared among extractive companies.

Infrastructure investment can potentially create significant employment, both directly through the construction of the infrastructure, for example, and indirectly through the supply chain and supporting business services such as finance, legal, and consulting services. The number of jobs created by infrastructure investment will, of course, vary depending on the country and the type of infrastructure. In the United States, economists estimate that $1 billion of infrastructure spending creates around 18,000 jobs.[83] In emerging markets, where labor-to-capital ratios are much higher, the number of jobs created for $1 billion of infrastructure could increase to as many as 200,000.[84] A recent World Bank report looking at the job creation potential of infrastructure estimated that, in the case of developing

82 For example, see *Islamic Republic of Afghanistan: Resource corridor strategy and plan*, World Bank, May 2013.

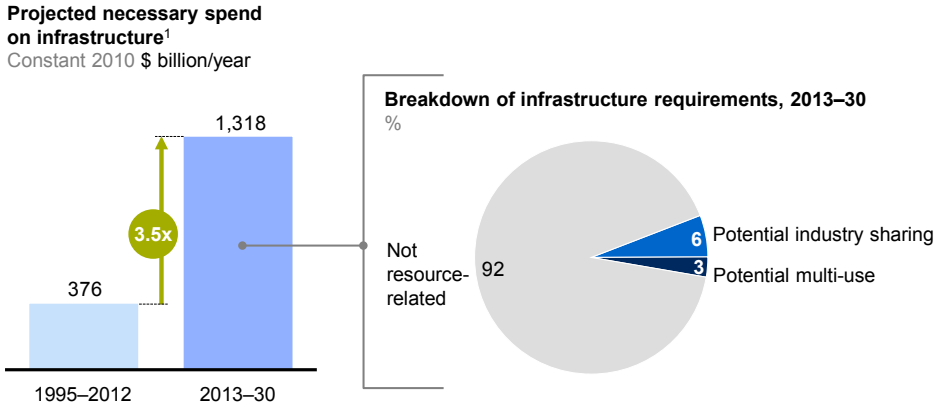
83 James Heintz, Robert Pollin, and Heidi Garrett-Peltier, *How infrastructure investments support the US economy: Employment, productivity, and growth*, Political Economy Research Institute and Alliance for American Manufacturing, January 2009.

84 *Investments in infrastructure: An effective tool to create decent jobs*, International Labour Organization policy brief, 2009.

oil-exporting countries in the Middle East and North Africa region, $1 billion of infrastructure spending could create around 49,000 jobs.[85] Drawing on this analysis, the $111 billion of annual investment in resource-related infrastructure that we estimate resource-driven countries could need over the next 17 years implies the creation of around 5.4 million jobs.

Exhibit 14

Resource-driven countries need to spend more than $1.3 trillion per year on infrastructure, about 9 percent of which relates to resources



1 The infrastructure spend covers power, pipelines, water, and transport (road, rail, and ports). See the appendix for further details on the methodology.
NOTE: Numbers may not sum due to rounding.
SOURCE: *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute, January 2013; McKinsey Global Institute analysis

GOVERNMENTS CAN ADOPT DIFFERENT STRATEGIES TO ENCOURAGE SHARING ONCE THEY HAVE EVALUATED ITS COSTS AND BENEFITS

Overall, shared infrastructure is a multibillion-dollar opportunity for resource-driven countries, but this will not necessarily happen without government intervention. That is because, in some cases, the distribution of costs and benefits will leave the main developer without incentives for sharing. This might be because that developer could have to carry most of the costs (both direct and indirect, such as efficiency losses) that relate to sharing without necessarily being able to recoup them from other users. Different actors may also work on different timelines, making sharing more difficult to achieve in practice. Even when incentives for sharing exist, there may be other barriers, such as coordination costs related to establishing the multi-user models.

85 Caroline Freund and Elena Ianchovichina, "Infrastructure and employment creation in the Middle East and North Africa," World Bank MENA Knowledge and Learning, number 54, January 2012.

In light of this, governments need to carefully evaluate the overall benefits and costs to determine whether sharing is desirable or even feasible for a given project. Let us discuss each in turn:

Societal benefits of sharing infrastructure

- **Economies of scale.** These are the cost advantages that can be obtained due to size—the cost per unit of output generally decreases as scale increases and fixed costs are spread across more units of output. Operational efficiency is also often greater with increasing scale, leading to lower variable costs. The marginal capital cost of additional power-generation capacity, for example, is lower than the cost of building an entire new power plant.[86] Another example is ports, which can be used by multiple parties with limited additional costs provided there is capacity.

- **Economies of scope.** While economies of scale primarily refer to reductions in the average cost per unit associated with increasing the scale of production for a single product or service, economies of scope refer to lowering the average cost of producing two or more different services. For example, building a pipeline can help to facilitate the creation of roads following the same route as one that has already been cleared. Similarly, introducing electricity to an area greatly facilitates the provision of water by powering pumps.

- **Spillover effects.** These happen when there is an economic impact—either positive or negative—on those who are not directly involved. In the case of the cost of infrastructure, the development of a local power sector and transport links, for example, can facilitate local economic development, creating new jobs and investment.[87] The extent of the impact will vary significantly based on the type of asset as well as the local geographical, economic, and social context. These broader economic effects are the primary rationale behind the development of "resource corridors" based around mineral or oil deposits. The Maputo Development Corridor, which links Maputo, Mozambique, and Pretoria, South Africa, through infrastructure developed for coal exports, is one example.[88] Another example is the Southern Guinea Growth Corridor, which focuses on identifying opportunities for sharing the important rail, port, and fiber-optic and wireless communications links used to support the extraction of Guinea's rich bauxite and iron ore deposits and the broader economic growth of the surrounding area, which is home to 1.8 million people.[89] Initial estimates put the potential long-term additional output from this corridor at up to $3 billion a year—that's more than half of Guinea's current GDP. Another example is the joint project launched by the World Bank and the government of Afghanistan to develop oil and copper deposits through the use of multi-user infrastructure. The plan is to leverage development of the Aynak copper mine to establish water supply to Kabul, upgrade and maintain roads, and build a north-south power transmission line. This scheme will be

86 *Leveraging the mining industry's energy demand to improve host countries' power infrastructure*, Vale Columbia Center on Sustainable International Investment, Columbia University, September 2012.

87 Stéphane Straub, *Infrastructure and growth in developing countries: Recent advances and research challenges*, World Bank working paper number 4460, January 2008.

88 Hudson Mtegha et al., *Resources corridors: Experiences, economics and engagement—A typology of sub-Saharan African corridors*, EI Source Book, 2012.

89 *Simandou: Economic impact report*, Rio Tinto, May 2013.

financed through a combination of public and private investment, and the hope is that it will also unlock agricultural and industrial opportunities to underpin Afghanistan's economic development.[90]

- **Alternative sources of this infrastructure.** This assesses the likelihood that the infrastructure would not have been built otherwise. The potential benefits of infrastructure sharing are higher if it was otherwise unlikely that the infrastructure would be built due to financing or other constraints.

Costs of sharing infrastructure

- **Efficiency losses.** In some cases, vertical integration results in higher efficiency than the separate operation of infrastructure and extraction. For example, it can potentially be helpful to have rail infrastructure owned by the resource company so that it can better coordinate production and delivery.

- **Coordination issues.** Sharing infrastructure can create costs due to coordination issues. For example, multiple users of a rail network require more sophisticated management to ensure that demand is spread so bottlenecks can be avoided at key times. Operations in Queensland, Australia, suffered from bottlenecks when several coal producers, the local railway operator, and the port could not coordinate effectively.[91]

- **Contracting costs.** Information asymmetries can limit the scope of contracting, which is required in cases of infrastructure sharing, creating additional costs over the life of the project. Contracting issues can also cause delays to infrastructure projects.

- **Obstacles to future expansions of production capacity.** Infrastructure building takes time and requires large up-front investment. Sharing may trigger infrastructure bottlenecks more quickly and make expansion even more difficult.

- **Issues with setting up practical compensation mechanisms.** Compensation for the use of infrastructure must consider such issues as the wide divergence between its marginal and average cost due to the high capital intensity of these projects, the cost of changes in real options from sharing, and the effect of incentives on the completion of capacity expansions and on efficient operations. This compensation should ideally be priced so that secondary users pay the full marginal cost of providing the infrastructure, including any additional coordination costs incurred due to sharing. The ability to put in place such mechanisms can be hindered by information asymmetries, differing time scales, and the lack of an efficient regulatory body, which sometimes make it harder to contract among the different players.

90 Hudson Mtegha et al., *Resources corridors: Experiences, economics and engagement—A typology of sub-Saharan African corridors*, EI Source Book, 2012.

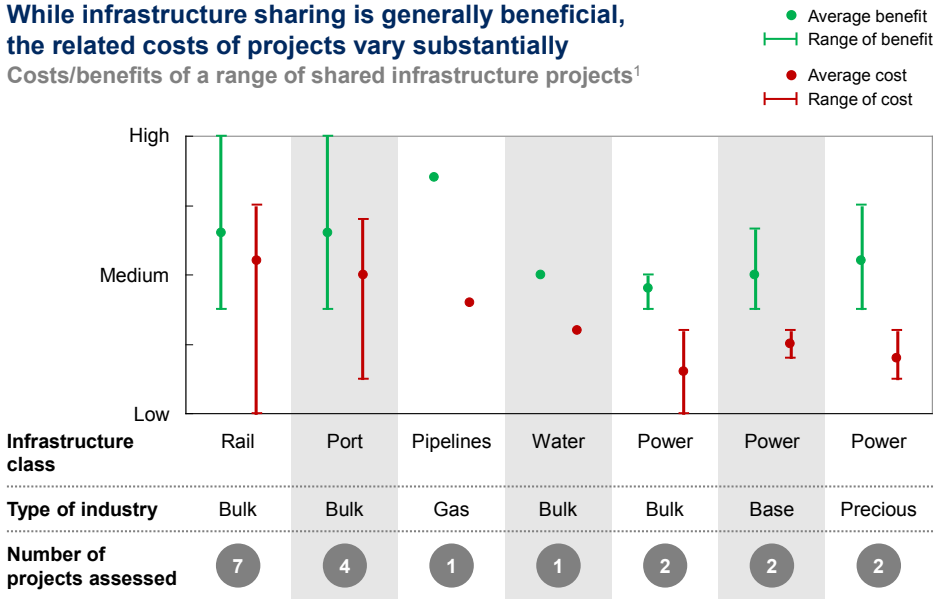
91 Ibid.

The distribution of these benefits and costs depends on the project, the country, the type of resource, and the type of infrastructure. We have examined 19 case studies that show huge variety in the levels and distribution of benefits and costs (Exhibit 15).[92] Overall, it appears that power projects are good candidates for sharing as the benefits are high and coordination costs low. But port and rail projects, while often having substantial benefits, also have the potential to create high costs from sharing and therefore must be particularly carefully reviewed.

Exhibit 15

While infrastructure sharing is generally beneficial, the related costs of projects vary substantially

Costs/benefits of a range of shared infrastructure projects[1]



1 Based on an assessment of four types of benefits (economies of scale, economies of scope, spillover effects, and the likelihood of alternative investment) and five types of costs (efficiency loss, coordination issues, contracting issues, obstacles to future expansion, and issues with compensation mechanisms). Each benefit/cost was evaluated from 1 (low) to 3 (high) and then averaged across projects within the same category.

SOURCE: Vale Columbia Center; McKinsey Global Institute analysis

The appropriate role for government intervention will depend on this assessment of the costs and benefits of sharing, as well as the other barriers preventing it. Sometimes the best outcomes result from each resource company developing its own infrastructure, as is the case with the Pilbara iron ore industry in Australia (see Box 3, "Examples of different approaches to government involvement in resources infrastructure").

In such cases, the right option for the government may be to step back. In other cases where the benefits of sharing are important and largely accrue to the main developer, or if contracting with other parties is straightforward, the government may not have to do much other than ensure appropriate regulatory supervision. This is the case with power projects such as Anglo American's Khanyisa project in South Africa. When governments do intervene, it can take many forms, from "nudging" various players to come together to providing compensation and/or coinvestment in cases where there are substantial effects on society. On many occasions, governments choose to be proactive in driving infrastructure building, acting as both developer and owner. Government ownership and operation of South Africa's bulk material railways through Transnet is one example; another is the Nigerian government's efforts to develop its gas pipeline infrastructure.

92 Many of these case studies are found in *Leveraging the mining industry's energy demand to improve host countries' power infrastructure*, Vale Columbia Center on Sustainable International Investment, Columbia University, September 2012.

The case studies we have highlighted suggest several important lessons, including the following:

- **Plan early.** Early planning and coordination are essential to ensure that infrastructure delivers maximum utility and efficiency. In Australia's Pilbara region, for example, much of the early infrastructure was built separately by mining operators that paid scant attention to sharing opportunities. Once made, these decisions are much more difficult to "unwind." Decisions about whether future capacity expansion might be needed to support broader economic goals should also be made early. Instead of building a 50-megawatt plant, one double that size could be built, in anticipation of meeting future needs. Of course, expanding capacity at the outset costs money, and that may have to come not only from the government, which has its own timetables for budget allocations, but also from others. Coordinating multiple sources of finance can be difficult, and governments in resource-driven countries will need to work with the private sector to align the timing, be willing to involve themselves in the creation of joint funding mechanisms, or establish a credible regulatory mechanism to ensure that secondary users make appropriate contributions.

- **Rigorously assess the costs and benefits of infrastructure sharing.** As we have discussed, a detailed assessment of the cost and benefits of sharing is vital.

- **Pick the right sharing model given the context.** We have identified five models for sharing infrastructure when it is appropriate. The models vary in terms of the users, operators, and owners that come into play (Exhibit 16). There is no one universally appropriate model, and indeed, in many cases a combination of them may be most effective. For example, if a third-party private operator is going to provide the infrastructure, the government is likely to need strong regulatory capacity to provide that operator with the incentives to invest without promising unreasonable returns. Similarly, consortia models can be put in place only in cases where several extractive companies are operating in the same sector and area. Government provision requires a strong and effective state that has access to sufficient funds to invest.

Exhibit 16

Selecting the right infrastructure sharing model is a critical part of maximizing societal objectives from infrastructure development

	Government-supplied	Public-private partnership	Consortium	Third-party private operator	Competitive suppliers
User	Multiple users	Multiple users	Multiple resource companies; maybe industrial users	Multiple resource companies; maybe industrial users	Multiple resource companies; maybe industrial users
Operator	Government	Government or an ad hoc entity	Ad hoc private entity	Private third party	Multiple competing third parties
Owner	Government	Government and at least one private party	Multiple private users	Private third party	Government or regulated private party
Examples	CFE, a utility, supplies electricity to most mines and oil fields (Mexico)	Port of Ehoala (Madagascar)	Richards Bay Coal Terminal (South Africa); Copper Belt Energy (Zambia)	CLH pipelines (Spain); CSX railroad (United States)	Aurizon Central Queensland Coal Network rail tracks (Australia)

SOURCE: Case studies; McKinsey Global Institute analysis

Box 3. Examples of different approaches to government involvement in resources infrastructure

No intervention. Sharing infrastructure with other users may impose efficiency costs on the primary user of infrastructure capacity. Many argue that this is the case with the rail and port infrastructure supporting the iron ore industry in Pilbara.[1] Australia's central and state governments have considered enforcing sharing of this infrastructure simply through regulation and conditions on mining agreements. At the same time, the integrated nature of bulk commodity supply chains from mine to port means that sharing might limit the ability of the mine operator to be sufficiently responsive to shifts in customer demand or changes to supply from a network of commonly operated mines. Furthermore, any operational issues or delays in any one of the mines would have a big effect on others run by companies in direct competition with one another. These two effects alone could reduce the operational efficiency of a multi-user rail and port system to between 10 and 20 percent below a single-user model.[2] Expanding the infrastructure also incurs major coordination costs, as the required capacity will depend on a number of factors, including the rate of economic growth in consuming economies and changes to production levels in competing countries.

Government as coordinator. One example of government playing a coordinating role is in Colombia. The government and the national federation of coal producers are working together on the development of a shared port and railway system for small and medium-sized coal mines. Given the substantial, multibillion-dollar costs involved, individual mining companies cannot afford the development of such infrastructure. For this reason, government-funded and public-private partnerships are being considered. Colombia needs to increase today's port capacity of 90 million tons a year by 48 million tons to cover expected 2020 production. It also needs to expand its railway network. This case illustrates the importance of economies of scale—building one large railway is cheaper than building many small ones. The government's role as coordinator is important to ensure that the allocation of costs is seen by all participants to be fair and transparent.

Government as project owner. Flaring of associated natural gas from Nigeria's oil installations has long been a major environmental concern as well as a waste of a valuable resource. Nigerian natural gas could be used for domestic electricity production or other types of industrialization, but to make this a reality Nigeria needs to build a network of pipelines at a likely cost of billions of dollars. The government is constructing and financing these pipelines through NNPC but aims to bring in private investors wherever possible. The government is playing a leading role not only because there is a national interest in gas-based economic development but also because historically private-sector investment in the mid-stream has been been hard to come by.

1 *Regulation for the future of Australia's natural resources sector*, BHP Billiton, April 2008.

2 Stephen O'Donnell, *Goonyella coal chain capacity review*, July 30, 2007.

Fiscal policy and competitiveness

Debates about how fiscal policy should be applied to resources sectors too often fail to take into account the fundamental trade-off between tax revenue and a competitive extractive industry. There is no doubt that high tax rates can reduce or even eliminate spending on exploration. In Alberta, Canada, exploration investment fell by 41 percent after the state's government increased its royalty charges.[93] It is imperative for resource-driven countries to offer a competitive environment for extractive companies. This is not easy. History shows that few countries have sustained leading positions in the resources sector.

Tax policy, by which governments determine the share of resource rents they take, is clearly an important tool to influence the competitiveness of their resources sectors (see Box 4, "Fiscal policy mechanisms"). But governments need to take a broader view of competitiveness that includes production costs—not just those related to geology, but also those driven by infrastructure and regulation—and policy risks such as the threat of expropriation, limits on capital flows, and arbitrary alterations to contracts or concessions.

ANALYZING THE ELEMENTS OF COMPETITIVENESS IN THE RESOURCES SECTOR REVEALS SEVERAL INSIGHTS

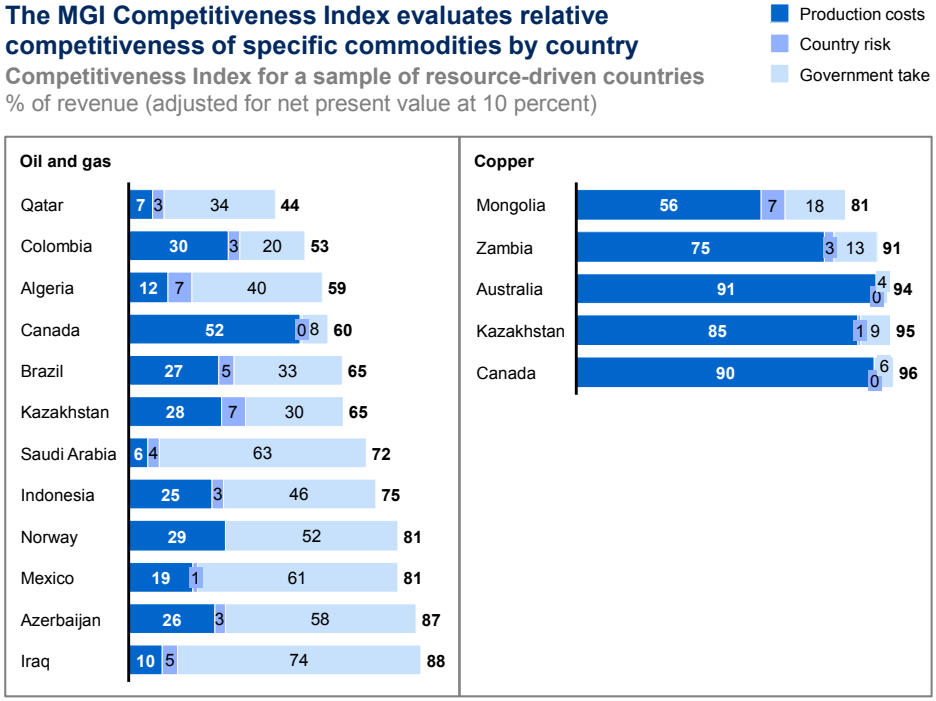
McKinsey has developed a new index of competitiveness in the resources sector—the Resource Competitiveness Index—that includes all three elements of competitiveness: production costs, country risk, and the government take, measured as a percentage of revenue (Exhibit 17).[94]

Exhibit 17

The MGI Competitiveness Index evaluates relative competitiveness of specific commodities by country

Competitiveness Index for a sample of resource-driven countries

% of revenue (adjusted for net present value at 10 percent)


Production costs
Country risk
Government take
Oil and gas
Qatar 7 3 34 44
Colombia 30 3 20 53
Algeria 12 7 40 59
Canada 52 0 8 60
Brazil 27 5 33 65
Kazakhstan 28 7 30 65
Saudi Arabia 6 4 63 72
Indonesia 25 3 46 75
Norway 29 52 81
Mexico 19 1 61 81
Azerbaijan 26 3 58 87
Iraq 10 5 74 88
Copper
Mongolia 56 7 18 81
Zambia 75 3 13 91
Australia 91 4 0 94
Kazakhstan 85 1 9 95
Canada 90 0 6 96

NOTE: Longer bars denote less competitive countries. Numbers may not sum due to rounding.
SOURCE: Wood Mackenzie; Morningstar; Ernst & Young; PricewaterhouseCoopers; McKinsey Global Institute analysis

93 *Statistical handbook 2009–2011*, Canadian Association of Petroleum Producers.

94 Exhibit 17 shows the index results for the oil and gas industry and the copper industry. A longer bar indicates a higher cost and therefore less competitive country. See the appendix for more detail on our methodology.

Box 4. Fiscal policy mechanisms

In our analysis, we use the government take as a proxy for fiscal policy. However, the way governments collect taxes in the resources sector, and the distribution of price and project risk, also affect competitiveness. Taxing resources extraction is fundamentally different from taxing ordinary business activity. In addition to standard taxation of the returns to capital, the tax system has to be designed to capture the resource rents (that is, the difference between the price at which an output from a resource can be sold and its respective extraction and production costs, including an adequate risk-adjusted return for the operator in order to encourage the operator's participation).

Broadly, there are three (not mutually exclusive) ways in which countries are able to secure revenue from their resources.[1] First, royalties and taxes can be paid in exchange for concessions through regular taxation or through taxes specific to the resource industry. The latter can be levied on volume or revenue (that is, royalties), on profits, or as a bonus paid upon the signing of an agreement or concession. Second, governments can enter production-sharing contracts that establish partial public ownership of a project and collect a share of revenue or profits. The government sometimes compensates the investor for its stake, but there are also cases of "free carry" in which no such compensation is offered. For example, the Ghana National Petroleum Corporation has a 10 percent free carry on all Ghanaian petroleum assets and an option to purchase an additional 20 percent at a fair market price.[2] Third, some countries retain full ownership of the asset, obtain the total value from the revenue of the products, and offer service contracts in which the provider's remuneration is fixed (Iran and Mexico use this approach with oil and gas).

The choice of fiscal mechanism has important implications for government risk and returns and therefore competitiveness. Three broadly applicable issues are worth considering:

- **Appetite for price risk.** Some fiscal systems increase the government's exposure to price volatility. For example, profit-based royalties allow a government to benefit from rising prices but reduce income when prices fall. Negotiations for any resource contract should acknowledge the risk from volatility and apportion that risk to the party most able to shoulder it. Parties should also be aware that rising resource prices can heighten domestic expectations on the contribution of extraction to the economy. Governments that choose to expose themselves to price risk and therefore maximize their share of revenue during price spikes should consider stabilizing mechanisms (see our discussion later in this chapter on spending the windfall).

- **Project neutrality.** Some fiscal systems can distort market incentives when investment decisions are being made. Systems such as profit-based royalties minimize these distortions and maximize potential revenue from the extractive industry. For instance, in a gold mine, the cut-off grade (that is, the minimum proportion of gold to waste at which a mine finds it worthwhile to extract a mineral vs. leaving it in the ground) would be higher under a revenue-based tax, and therefore less investment and production would occur but would be unchanged under a profit-based tax. The latter is desirable in this instance because it does not create an economic distortion.

- **Administrative burden.** Every fiscal system imposes overhead costs on governments and extractive companies; minimizing these costs increases competitiveness. A production-sharing scheme in the oil industry, for example, generally requires the government to sell its share of production independently in international markets and to set up a national oil company, generating a larger administrative burden than alternative fiscal mechanisms such as a corporate tax.

1 James Otto et al., *Mining royalties: A global study of their impact on investors, government, and civil society,* World Bank, 2006.

2 *Investment policy review: Ghana*, United Nations Conference on Trade and Development (UNCTAD), June 2003.

The index reveals the following insights:

- **Production costs vary significantly according to the type of resource.** Broadly, we find that production costs as a share of project revenue are higher in mining than in oil and gas. Taking an average across countries, the index shows that production costs in copper mining account for 75 percent of revenue compared with only 24 percent in oil and gas.

- **Production costs of new sites are generally higher.** Even for a specific type of resource, production costs vary significantly. That difference is widening as producers develop more marginal sites, which may have a lower quality of deposits or more significant infrastructure requirements due to remote locations and may impose greater factor-cost inflation than earlier sites. For example, the capital intensity of greenfield copper mining projects under development today is 75 percent higher than it was for mines developed between 2000 and 2011.[95]

- **Government take is linked to production costs.** The government take varies significantly depending on the type of resource. The average tax take as a share of revenue in oil and gas is more than three times the average take in copper. But there are significant variations in the government's take even for the same type of resource. In oil and gas, for instance, the take ranges from 8 to 84 percent of revenue. When we map production costs with the government take, there is a close negative correlation between the two. In essence, when production costs are high, the government take is necessarily lower to ensure competitiveness.[96] A clear implication of this is that governments cannot base their expectations of their resources take on the fiscal policies of their counterparts in other countries. Nor can they compare the take across different types of resources. They need to recognize the quality of the resource asset and then set an appropriate level of take. For example, the Canadian government's take is 8 percent of production costs, while the Iraqi government takes 74 percent. If Canada were to try to negotiate a government take equivalent to Iraq's, it would be left uncompetitive.

- **Significant value is lost due to risk.** Some countries are riskier than others. Calculated as a premium on the cost of capital, political or regulatory risk can sometimes reach almost 40 percent of the value of the government take. In Mongolia, for instance, the average country risk of all projects is 7 percent, and the government take only 18 percent. Reducing political and regulatory risks would allow Mongolia to increase its take significantly.

Rather than focusing purely on negotiating an appropriate government take, governments and extractive companies should work together to drive down production costs. Governments also need to improve the perception of risk. Managing these two elements would allow overall resource rents to increase, and the benefits ideally could then be shared by governments and extractive companies. Governments that have addressed these two elements have become significantly more competitive (see Box 5, "Chile in the 1990s").

95 Analysis based on Brook Hunt data from 2011.

96 In many countries, the government take is linked to a share of profits, so high cost means a lower take.

Box 5. Chile in the 1990s

Chile has vast deposits of high-grade copper but, as recently as the 1980s, its production lagged behind that of Canada and the United States.[1] In the 1990s, the government took targeted and concerted action to boost output. By 2003, Chile produced 4.9 million tons of copper, making it the world's largest producer.[2] Chile already had reasonably low production costs due to its favorable geology, but it took action focused on all three areas of our Resource Competitiveness Index, as described below:

- **Production costs.** Chile lowered costs by investing in the Norte Grande power grid, thereby staying ahead of increasing demand. When demand for electricity soared between 1995 and 2000, the cost of electricity fell.[3] Chile also invested in ten ports for public use in addition to the 14 already operating in 1980.[4]

- **Country risk.** The government put attractive foreign investment rules in place to ensure regulatory stability and policy transparency, and Fitch raised Chile's sovereign risk rating from BBB in 1992 to A+ today. Chile topped the Fraser Institute's 2001–02 "policy potential" ranking, which uses survey responses to rank countries on the competitiveness of their policies for the resources sector.

- **Government take.** Chile also used fiscal policy to attract investment. It forewent mining royalties until the mid-2000s and lowered taxes on profits reinvested domestically rather than repatriated.[5] It later increased tax rates in line with improved cost efficiency in production and lower country risk.

As a result of all these measures, Chile attracted $12 billion of FDI to the mining sector between 2003 and 2012.[6] Mining has become Chile's growth engine. Today, it is the largest contributor to GDP and produces 60 percent of total exports. Between 2001 and 2011, government income from mining increased by $12.9 billion.[7] To put that into context, it is nearly as much as the $13.8 billion Chile spent on tripling health and education spending during the same period. However, competitiveness of the resource sector can change quickly. Due to several changes such as tax increases and energy price rises, Chile has now fallen to 23rd place in the 2012–13 Fraser Institute "policy potential" ranking.

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1 Wood Mackenzie data.

2 *Annual statistical report for copper and other minerals*, Chilean Copper Commission, 2010.

3 Annual statistical and operational report of the Great North Interconnected System, 2010.

4 *Chile 2020 port and coastal infrastructure report*, Ministry of Public Works.

5 *Mining royalties in Chile*, Library of the Chilean National Congress, July 13, 2006.

6 *Foreign investment in mining*, Chile National Mining Society Documentation Centre.

7 *Annual statistical report for copper and other minerals*, Chilean Copper Commission, 2010.

THE PUBLIC AND PRIVATE SECTORS CAN BOTH TAKE STEPS TO REDUCE PRODUCTION COSTS

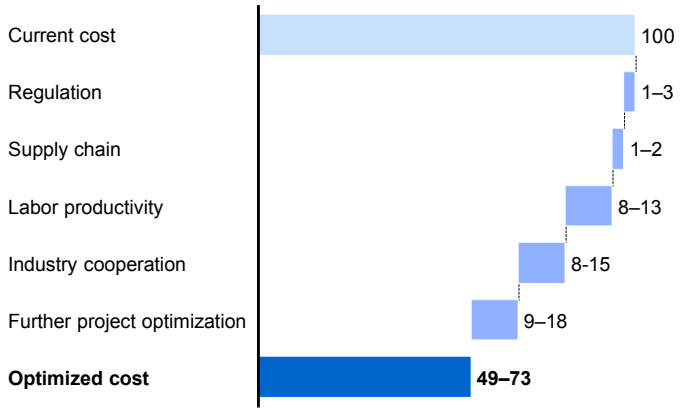
Governments obviously cannot control factors related to production costs, such as the proximity of resource deposits to the coast, the quality of crude oil, or mineral grades. But there are still ways to reduce capital and operating costs, notably by focusing on regulation, supply chains, productivity, and industry collaboration. Past McKinsey work on LNG projects in Australia found that government and industry action in these areas could more than halve operating costs (Exhibit 18).[97]

Exhibit 18

McKinsey research estimates that government and industry action can cut costs by more than 50 percent

Impact on potential cost reduction measure by government and industry[1]

%



1 Based on McKinsey analysis of liquefied natural gas (LNG) projects in Australia.
NOTE: Numbers may not sum due to rounding.
SOURCE: *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey Oil & Gas and Capital Productivity Practices, May 2013; McKinsey Global Institute analysis

Regulation

Regulation often raises costs, but there are a number of ways to address this. Consistency limits the cost of regulation, which sometimes varies among industries or differs from international standards. In Australia, for example, standards for the treatment and monitoring of coal seam gas water are higher than water standards in the mining industry, leading to higher costs. Australia's electrical wiring standards on land-based rigs are different from international standards, which means that rigs need rewiring before they can be used in Australia. Harmonizing regulations across industries and bringing them into line with international standards is a useful way of cutting costs.

The efficiency of regulation also has a bearing on costs. The time it takes for an extractive company to obtain the necessary approvals to proceed with a project varies enormously from one country to another. On average, it takes three months longer to obtain an environmental impact assessment in Australia than it does in Canada, adding $0.03 per million British thermal units in the case of Australia's LNG production. In many countries, authorities with overlapping jurisdictions regulate the resources sector; dealing with all of them prolongs the approvals process for extractive companies. In Peru, companies have to navigate

97 *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey Oil & Gas and Capital Productivity Practices, May 2013.

at least ten government agencies to obtain all the permits required for a new mine, a process that can take up to six years. The country has a backlog of 133 environmental impact studies.[98]

Reducing the number and frequency of regulatory changes is another effective way of reducing costs. Every time a regulation is altered, it raises the risk that projects may have to be redesigned, leading to additional costs and schedule slippage. Based on the experience of Australian contractors, we believe that instability in regulation can cause a delay of one month for front-end engineering and design.

Supply chains

The lack of an effective local supply chain can raise costs by forcing companies to import expensive equipment. In many cases, local-content regulations have harmed sector competitiveness. However, if done well, local content strategies can boost competitiveness in the resources sector and also create significant employment. See the section on local content later in this chapter for further discussion.

Labor productivity

Low labor productivity contributes to higher production costs in many countries. Even among countries with similar overall levels of labor productivity, large differences in productivity often exist in their resources sectors. For example, the labor productivity in Australia's LNG industry lags behind its Canadian counterpart by 8 percent and behind the US industry by 30 percent. A number of factors can account for this productivity gap, including shortages of material and equipment and an inexperienced workforce.

The most important lever for boosting labor productivity is increasing the supply of skilled labor. One way of doing this is streamlining the procedures that expatriate workers need to go through before entering a country. Brazil, for instance, increased work permit approvals for foreigners by 25 percent when its oil and gas production was taking off. In the longer term, however, it is important to boost domestic skills, as Fundación Chile did by teaming up with the Chilean government to provide mass training programs for prospective mining industry workers.

Another way to improve labor productivity is to build stronger local communities where workers can live with their families. The benefits are twofold. Not only does this improve productivity and satisfaction among workers, but it can also, under the right conditions, promote higher local economic spillovers. Providing housing for miners and their families near worksites has the benefit of cutting down on long commutes. Developing the skills and capabilities of people in the local communities, rather than relying on migrant workers, is another way of boosting labor productivity.

98 *Assessment of Peru's competitiveness in the mining industry*, Peruvian Chamber of Mines, 2013.

Industry cooperation

Extractive companies can also reduce costs by cooperating with one another. For instance, they can qualify suppliers jointly and standardize contracts between the industry and suppliers (even while taking antitrust concerns into account), saving time and effort in procurement. One example of this approach is First Point Assessment, which registered more than 3,000 suppliers and more than 85 purchasing organizations in the United Kingdom, Ireland, and the Netherlands.

Another useful approach is to smooth demand by planning construction schedules so that different operators are not competing for the same resources, such as rented equipment or class-A welders. At the same time, buyers and providers can better match their activities to expected market demand, thereby reducing wage inflation and lowering the cost of renting equipment.[99] PILOT Forward Workplan, pioneered by the UK oil and gas industry, centralizes information from buyers of oil and gas support services on the services they require, the contract value, and the likely contract date. The initiative has more than 190 signatories, including Chevron, ConocoPhillips, and ExxonMobil.

It is often sensible to share plant infrastructure. Extractive companies can build new capacity next to existing plants so that both facilities can share infrastructure, creating economies of scale that reduce capital and operational expenditure, the need for engineering labor, and operational expenditure. Companies can also share operating and maintenance facilities across plants.

Finally, companies can work together to define common health, safety, and environmental standards and invest jointly in the infrastructure needed to support them. Although we don't look at this issue in detail, we find that there are significant opportunities to reduce costs by maximizing the efficiency of projects through such techniques as lean design engineering and production, best-in-class contract management, and best-in-class claims management.[100]

TRANSPARENCY AND POLICY CERTAINTY CAN REDUCE COUNTRY RISK

To reduce country risk, governments first need to understand how companies and investors perceive their countries and which risks raise the biggest red flags. A useful starting point is the Fraser Institute's survey of mining companies.[101] Fifty-nine percent of companies surveyed cited concerns about corruption and lack of transparency, making these the most important issues. Nearly as important is uncertainty about new regulation, cited by 57 percent of respondents. Political stability and land claims are two other issues unearthed by the survey. We find that there are three broad approaches that can help to reassure investors:

99 *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey Oil & Gas and Capital Productivity Practices, May 2013.

100 For further details, see *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey Oil & Gas and Capital Productivity Practices, May 2013.

101 *Survey of mining companies 2012–2013*, Fraser Institute, February 2013.

Building government capacity on contracting

In many resource-driven countries, the government institutions that negotiate agreements for the development of resources struggle with a lack of contracting skills. This can lead to them signing contracts that they later realize they did not fully understand and may believe are unfair, raising the risk of revisions in the future that destabilize extractive companies. One particular concern is that agreements fail to take into account price volatility, and therefore the government doesn't benefit from higher prices through an increased take. Such an agreement would theoretically benefit the extractive company, but it would be a mistake to view this as a real advantage for the company. Extractive companies have more to gain from a contract that is fair to both sides and therefore has a high chance of lasting for the lifetime of the project. In governments' interactions with extractive companies, it is particularly important that they have strong market intelligence that encompasses prices, trends, investment dynamics, the economics of exploration, and the drivers of domestic competitiveness. There has been some progress in government capability building. For example, the International Bar Association worked with civil society groups and academic institutions to develop the Model Mining Development Agreement, which aims to integrate economic, social, and environmental concerns into mining agreements.[102] Many international organizations have also supported capability-development programs.

Formal mechanisms

Signing an international investment agreement (IIA) can be an effective first step in efforts to reduce investors' perception of risk, and therefore increase FDI flows.[103] The United Nations Conference on Trade and Development (UNCTAD) argues that IIAs add to the security, transparency, stability, and predictability of the investment framework through three kinds of provisions: on standards of treatment (that is, ensuring that investors from that country are treated at least as well as other international investors); on compensation guarantees (for example, on how compensation is determined if assets are expropriated); and on the settlement of disputes. On the latter, IIAs offer a framework for international arbitration that depoliticizes disputes and sends a useful signal that governments are committed to honoring their contractual obligations. Dispute settlement boards, which are enabled by IIAs, are also desirable because they are a cost-effective way to resolve emerging issues.

Stabilization clauses that promise the terms of a contract will not change even if the law does can also be incorporated into concessions and other agreements. These are particularly useful in combination with arbitration clauses in which the host government accepts arbitration rules from a country whose legal system is preferred by the company in question.[104] However, history has shown that even these types of provisions cannot entirely mitigate risk if there is a perception within a country that it is not receiving its "fair share" of its resource wealth.

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102 "Model mining development agreement," MMDA Project, www.mmdaproject.org.

103 *The role of international investment agreements in attracting foreign direct investment to developing countries*, UNCTAD, 2009.

104 Abebe Abebayehu Chekol, *Stabilisation clauses in petroleum development agreements: Examining their adequacy and efficacy*, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, 2010.

Clear principles for government interactions with communities and companies

Although building government capabilities in contract writing and putting in place formal mechanisms around those contracts are partial answers, government officials and industry leaders also need to manage public expectations when resources are discovered. Many citizens will have a strong sense of local identity that often fuels demand for a greater share of the resource rents. Ghana is one country that has experienced land disputes after the government allocated land for mining without involving local communities in the decision.[105] Communicating the discovery of a resource through a stock-exchange announcement that by its nature focuses on the value that the resource creates can inflate expectations of impending riches. An official government statement may avoid this trap.[106]

Reassuring communities—and ensuring that they see themselves as joint beneficiaries of the development of resources—also reassures investors. One example of community engagement in action is South Africa's Broad-Based Black Economic Empowerment codes, which call for certain levels of equity ownership for previously disadvantaged groups. Some firms, including Richards Bay Minerals, have sought to ensure that ownership is at the community level rather than the national level.[107] Allowing and encouraging joint ventures between foreign investors and local firms has also proved to be an effective mechanism for reassuring investors about country risk—and actually reducing it. In fact, joint ventures are the single most popular mechanism for reducing risk among investors.[108]

It is also crucial for governments to hold regular consultations with industry leaders so that there is less scope for surprises and that perceptions of risk are lowered. These discussions should not focus exclusively on the level of taxation but should embrace the broader common goals of how to maximize value for both sides by lowering costs and risk. The government of Queensland, Australia, for example, conferred with representatives from the mining industry on addressing infrastructure gaps, which helped to smooth the path to the addition of rail capacity to support up to 300 million more tons of annual coal output.[109]

105 *Mining: Partnerships for development toolkit (third edition)*, International Council on Mining and Metals, 2011.

106 This is discussed in further detail in the section later in this chapter on spending the windfall.

107 Twenty-four percent of Richard Bay Minerals is owned by the local community, and 2 percent by its employees.

108 *World investment and political risk 2012*, Multilateral Investment Guarantee Agency (World Bank Group), 2013.

109 Cole Latimer, "Solving the infrastructure GAP," *Australian Mining*, July 13, 2012.

Local-content development

Resource extraction makes substantial contributions to economic development through employment, skills development, and supply chains. In the oil and gas sector and the mining sector, extractive companies spend between 40 and 80 percent of their revenue on the procurement of goods and services. In some cases that exceeds tax and royalty payments.

Definitions of what constitutes local content or a local supplier vary. For example, when defining a "local" company, the World Bank focuses on the percentage of local ownership, while the African Development Bank uses the place of registration and presence of nationals on the company's board and among its shareholders.[110] Some definitions of local content distinguish between companies by their location within the country. For example, in Ghana, Newmont gives the highest priority to what it describes as "local local" companies, which it defines as suppliers situated within the immediate mining area or in the geographical area affected by mine operations, and which are more than 50 percent Ghanaian-owned.[111] Further complications arise when trying to distinguish between a locally owned importer and a foreign-owned company that manufactures and sources its products locally. Our definition of local content includes goods and services where the value-add activities are conducted in the country. We also distinguish between those activities performed by local versus foreign labor.[112]

Increasing the proportion of goods and services that companies procure locally—local content—tends to be a central goal for policy makers in resource-driven countries. The vast majority of resource-driven countries have some form of regulation to foster local content. However, poorly designed local-content regulation can compromise the competitiveness of the resources sector and thereby endanger the jobs and investment that it would otherwise bring. There is also the potential risk that such regulation violates the terms of free trade agreements.

110 Jill Wells and John Hawkins, *Increasing local content in the procurement of infrastructure projects in low income countries*, Institution of Civil Engineers, 2008.

111 *Increasing local procurement by the mining industry in West Africa*, World Bank, January 2012.

112 For the purposes of understanding local content potential, we do not consider profits and ownership.

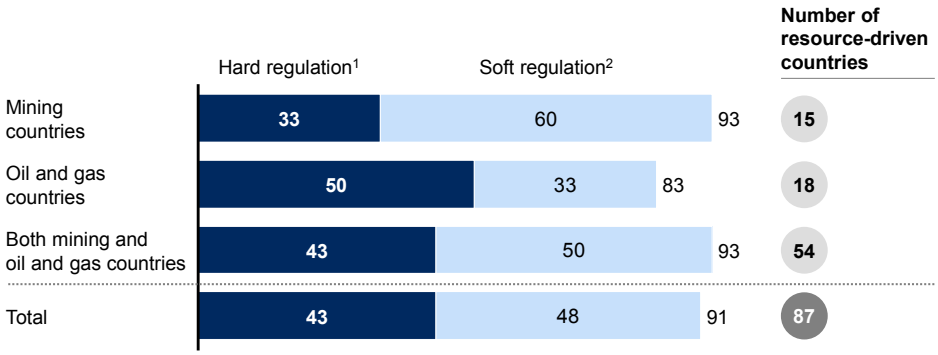
MORE THAN 90 PERCENT OF RESOURCE-DRIVEN COUNTRIES HAVE SOME FORM OF LOCAL-CONTENT REGULATION IN PLACE

Many governments are striving to increase the share of local content. We have scanned the globe and mapped the local-content regulations in place in resource-driven countries. We find that more than 90 percent of resource-driven countries have some form of local-content regulation and that mining is as intensively regulated for local content as oil and gas (Exhibit 19).

Exhibit 19

More than 90 percent of resource-driven countries have some form of local-content legislation

% of countries with different regulations



1 Defined policies with set targets governing the extractive industry's sourcing and procurement of services and goods.
2 "Soft" targets that are not obligatory or are vaguely defined, loose requirements to set up subsidiaries, contractual agreements for technology transfer.
SOURCE: McKinsey Global Institute local content database; McKinsey Global Institute analysis

We make a distinction between "hard" and "soft" local-content regulations. Angola, Brazil, Nigeria, and Indonesia all have hard regulation—in other words, specific targets and quotas such as the share of goods, services, or manpower that must be procured locally—and requirements on extractive companies to set up local subsidiaries and offices when they are operating in these countries. These commitments may be enshrined in law or included as part of licensing discussions. In Angola, for instance, at least 70 percent of a company's workforce must be local. In Indonesia, companies procuring services must commit to a minimum of 35 percent local content for contracts above $100,000. Soft regulations, adopted by Mozambique, Australia, and Mexico, among others, typically have targets that are not obligatory, may be more vaguely defined, and may include contractual agreements for the transfer of technology to local partners.

Some resource-driven countries, among them Chile, Canada, Lithuania, and Norway, do not have either type of local-content regulation. Indeed, Chile and Norway have phased out many of their local-content provisions (see Box 6, "Norway: From zero to local to global").[113] Other countries have never had any local-content regulation.

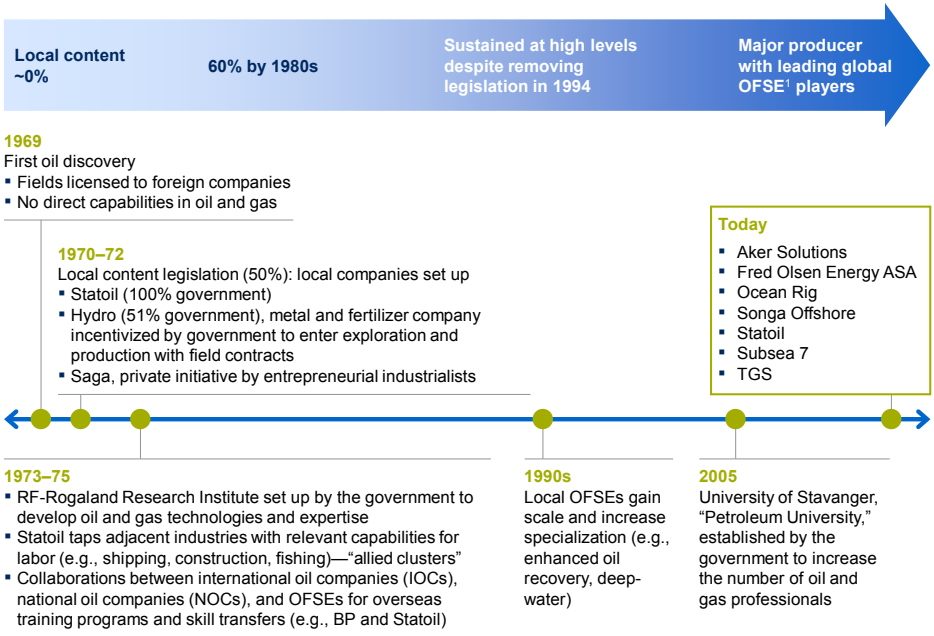
113 Norway had hard targets in place at an earlier stage of the domestic oil sector's development but removed them after the sector became more competitive.

Box 6. Norway: From zero to local to global

Upon discovering oil, Norway had a very different starting point than many low-income resource-driven countries today (among them, a large shipbuilding industry and significant tertiary education to support access to skills). Norway nonetheless can provide some useful lessons on the pivotal role governments can play in encouraging local content (Exhibit 20). Norway successfully strengthened the competitiveness of local players by encouraging local enterprises, capability building through R&D and education, and partnerships with industry. When Norway discovered oil reserves in the late 1960s, it had no expertise in oil and gas and had lower per capita income than its European neighbors.[1] Today Norway is a successful producer of oil-field services and equipment and has global companies working around the world.[2]

Exhibit 20

The Norwegian experience of developing local content in oil and gas


Local content ~0%
60% by 1980s
Sustained at high levels despite removing legislation in 1994
Major producer with leading global OFSE[1] players
1969
First oil discovery
Fields licensed to foreign companies
No direct capabilities in oil and gas
1970–72
Local content legislation (50%): local companies set up
Statoil (100% government)
Hydro (51% government), metal and fertilizer company incentivized by government to enter exploration and production with field contracts
Saga, private initiative by entrepreneurial industrialists
Today
Aker Solutions
Fred Olsen Energy ASA
Ocean Rig
Songa Offshore
Statoil
Subsea 7
TGS
1973–75
RF-Rogaland Research Institute set up by the government to develop oil and gas technologies and expertise
Statoil taps adjacent industries with relevant capabilities for labor (e.g., shipping, construction, fishing)—"allied clusters"
Collaborations between international oil companies (IOCs), national oil companies (NOCs), and OFSEs for overseas training programs and skill transfers (e.g., BP and Statoil)
1990s
Local OFSEs gain scale and increase specialization (e.g., enhanced oil recovery, deep-water)
2005
University of Stavanger, "Petroleum University," established by the government to increase the number of oil and gas professionals

1 Oil field service equipment.

SOURCE: IHS Herold; press search; company websites; McKinsey Global Institute analysis

1 Erling Røed Larsen, *Escaping the resource curse and the Dutch disease? When and why Norway caught up with and forged ahead of its neighbors*, Statistics Norway Research Department Discussion Papers number 377, 2004.

2 *Facts 2012: The Norwegian petroleum sector*, Ministry of Petroleum and Energy and Norwegian Petroleum Directorate, 2012.

Box 6. Norway: From zero to local to global (continued)

There have been a number of components to Norway's success:

- **Introduced targeted regulation.** When Norway discovered oil, the government set up three local oil companies: Statoil, Hydro, and Saga. A royal decree in 1972 stated that when Norwegian suppliers were competitive in terms of price, quality, and delivery reliability, they should be awarded the contract.[3] In addition, a Petroleum Code required operators to inform the Ministry of Petroleum and Energy about bids from suppliers, and the ministry could demand that Norwegian firms be included on the list of bidders. Foreign firms could not be excluded, but the ministry had the authority to change who was awarded the contract.

- **Leveraged existing capabilities.** In the early years after the discovery of oil, Norway rapidly built up its capabilities in oil and gas by tapping into manpower from other industries, including maritime services, fishing, and construction.

- **Invested in education and R&D.** Norway proactively developed R&D and technical capabilities. For operators on the Norwegian shelf, the tax system also classified R&D-related costs as immediately deductible. The government provided direct funding to universities and research institutes and set up education and research infrastructure on a large scale—including the University of Stavanger and RF-Rogaland Research—to boost skills and develop new technologies. Close collaboration ensured that these efforts matched the industry's needs. There was also a drive to invest in new technology. Statoil's LOOP program focused on supporting startup companies by providing expertise, facilities for pilot tests, and financial support.

- **Partnered with the private sector.** Norway set up strategic collaborations and partnerships with foreign private companies. By the late 1980s, Statoil had developed proprietary technologies and skills through a long-term partnership with BP. The two companies co-operated in gaining access to acreage in new frontier areas. Their initial focus included Angola, Azerbaijan, China, the Democratic Republic of the Congo, Kazakhstan, Nigeria, Russia, and Vietnam. BP was the operator to start with in most cases, but as time went on Statoil was able to operate independently. Statoil also has a long tradition of building partnerships with leading oil-field-services companies, most recently on subsea production systems. In 1994, Norway phased out legislation mandating local content, ensuring that providers of local services were fully exposed to international competition. Today Norway is a successful producer of oil-field services and equipment and has global companies working around the world. Norway has developed a significant domestic cluster of suppliers to oil and gas operators employing 114,000 people in Norway and achieving sales of $52 billion in 2010.[4]

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3 Per Heum et al., *Enhancement of local content in the upstream oil and gas industry in Nigeria: A comprehensive and viable policy approach*, Institute for Research and Business Administration, 2003.

4 O. Leskinen et al., *Oil and gas cluster: A story of achieving success through supplier development*, Harvard Business School, 2012.

LOCAL CONTENT HAS HIGH POTENTIAL ECONOMIC VALUE BUT IS DIFFICULT TO GET RIGHT

The extractive industry can drive considerable domestic economic activity through its local spending. A recent McKinsey study of the LNG sector in Australia showed that over 40 percent of the industry's total spending was recycled through the local economy via capital and operational expenditure (including salaries).[114]

There are arguments for and against local-content policies.[115] Proponents believe they are one way to foster economic development in countries that would otherwise struggle to diversify in the face of concerns about Dutch disease. They argue that intervention to encourage local content has a number of benefits and is necessary to address market failures. It can offer encouragement to local entrepreneurs to take part in the exploration of resources or supply to the resources industry. Links with multinational firms can help local businesses to build up expertise. And local-content regulations can overcome the disadvantage that small firms have in entering a sector where scale benefits give large companies a competitive edge. Local-content regulation can play an important role in creating local jobs, given that the resources sector is highly capital-intensive and therefore creates few direct jobs. Local procurement is also a way of compensating local communities and vulnerable groups from any adverse impact they may feel from extractive activities.

Nevertheless, the case for local content is not clear-cut. Local-content regulation can often impose a large opportunity cost that can undermine the competitiveness of the resources sector and the taxes, jobs, and investment it creates. Regulation can, for instance, cause cost inflation or delay the execution of projects. Brazil has increased local-content requirements to up to 65 percent in bidding rounds for offshore licenses. Given the profile of typical offshore production, this often implies that operators in Brazil are legally bound to source FPSO vessels locally.[116] In the past, local operators took much longer to build these vessels than global companies, leading to significant project delays. While performance of Brazilian shipyard operators appears to have improved recently, there is still the potential risk of delays in the execution of projects and the ramping up of production. Local-content requirements could even potentially harm job creation. For example, in some countries, if a company is locally registered it can meet local procurement criteria. However, these companies may simply be importing foreign equipment and employing few workers. Foreign-owned manufacturing firms with operations in the country to manufacture equipment and machinery—and therefore employing local people—could lose out to these importers. Clearly governments need to balance any economic benefits from local-content provisions against such negative impact. But, unfortunately,

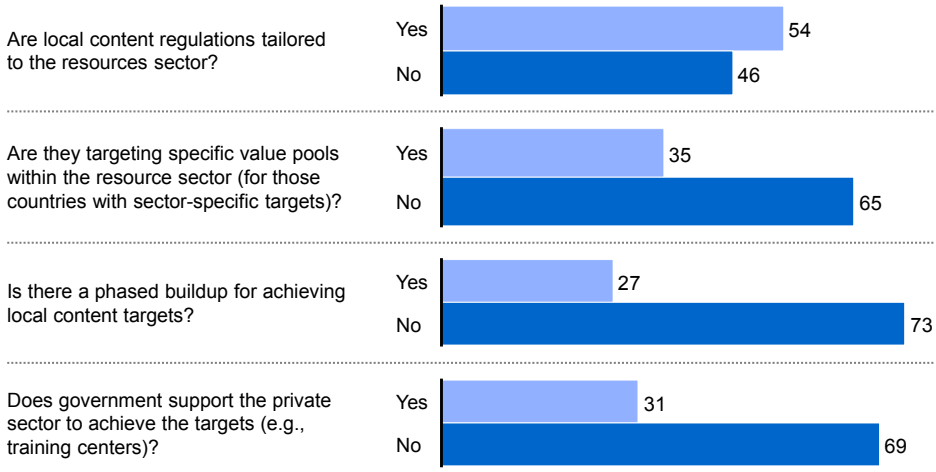
114 *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, McKinsey & Company Oil & Gas and Capital Productivity Practices, May 2013.

115 Alberto Melo and André Rodríguez-Clare, *Productive development policies and supporting institutions in Latin America and the Caribbean*, Inter-American Development Bank working paper number C-106, 2006; M. Weitzman, "Prices vs. quantities," *Review of Economic Studies*, volume 41, number 4, October 1974; Magnus Blomström and Patricio Meller, eds., *Diverging paths: Comparing a century of Scandinavian and Latin American economic development*, Inter-American Development Bank, 1991.

116 Based on expert interviews. The average is based on different vessel types, four different global suppliers, and six local consortia.

the fact is that a great deal of current local-content legislation is not well designed (Exhibit 21).

Exhibit 21
Current local content regulations are often not well designed
% (n = 27[1])



1 Sample is focused on the 27 (of the total set of 87) resource-driven countries that have hard legislation.
SOURCE: McKinsey Global Institute local content database; McKinsey Global Institute analysis

We have found evidence of the following four major gaps:

- **Lack of sector-specific requirements.** Almost half of resource-driven countries in our database had blanket requirements on local content that apply across all sectors. Angola, for instance, prefers national private or state-owned suppliers if their prices are no more than 10 percent higher than those of foreign suppliers regardless of the sector. Kazakhstan stipulates that local content in public procurement in general shall be a minimum of 20 percent for goods and 15 percent for services and construction. Venezuela restricts businesses (with more than ten workers) to having no more than 10 percent of their workforce consist of foreign staff and limits foreign employees' salaries to no more than 20 percent of the total payroll.[117]

- **Failure to target value pools.** Approximately two-third of countries in our database do not target specific value pools such as basic materials (for example, steel and cement), low- to medium-complexity equipment and parts (such as pumps, explosives, and chemicals), or high-complexity equipment and parts. Of those countries that do target specific value pools within the resources sector, at least half fail to target the correct value pools (in terms of fit with local capabilities). For example, the Democratic Republic of the Congo requires 96 percent of roles in the mining sector—and 98 percent of management positions—to be filled by nationals, but the requisite number of people with the necessary technical and managerial skills and experience are simply not available.

117 Silvana Tordo et al., *Local content policies in the oil and gas sector*, World Bank, July 2013.

- **No time frames stipulated or sunset clauses defined.** Very few resource-driven countries with local-content regulation take a phased approach in which they gradually build up the share of local content. Instead, most regulation calls for the immediate fulfillment of local-content shares. The result is either that targets are so high that they compromise competitiveness, in some cases meaning that a resource is not developed at all, or so low that they are meaningless in terms of offering economic benefits to the local population. Ghana, for instance, has set realistic targets given its stage of economic development, requiring that participation by Ghanaians be at least 10 percent of the value of goods and services in the first year, 20 percent in the second year, and an additional 10 percent for each year after that. Ghana stipulates that at least 30 percent of technical staff and 50 percent of management should be Ghanaian, rising to 80 percent in five years.[118] Brazil is another example of phased local-content regulation. Petrobras has minimum local-content requirements that require certain equipment levels to gradually increase each year, with a target of 95 percent to be achieved by 2020. In addition, the inclusion of some form of sunset clauses is important. If companies believe they can rely indefinitely on positive discrimination of local content regulation, the incentive to become globally competitive is reduced. In all our research, despite the importance of sunset clauses, we found no such thing in any country's current local-content regulation.

- **No supporting government institutions.** In more than two-thirds of the countries in our database, there was no structural government support for resource companies to achieve local-content targets through training centers, for instance, or financing for local suppliers to help them build up their business. One notable exception is the National Training Centre Abu Dhabi, whose remit is providing health and safety training. It is a United Arab Emirates Ministry of Education–approved institution and is accredited by the United Kingdom's National Examination Board in occupational health and safety.[119] The government of Abu Dhabi has also taken action to ensure that the resources sector is equipped with the latest technology. In 2012 the Education Council's Program Development Committee announced in its 2030 strategy outlook the objective of improving higher education and ensuring that R&D is better able to support industry.[120] Brazil and Malaysia are other examples of countries where government has worked closely with the private sector to help achieve local-content targets; these examples are discussed in further detail later in this section.

118 Ibid.

119 *Our company*, National Training Centre Abu Dhabi, 2013.

120 *Abu Dhabi education reform: The road to 2013*, Abu Dhabi Education Council, 2012.

MCKINSEY HAS IDENTIFIED FIVE PRINCIPLES OF EFFECTIVE LOCAL-CONTENT POLICY

How can governments arrive at successful local-content policies? Based on McKinsey's work with clients in the sector and an analysis of case studies, we find that there are five useful—indeed fundamental—principles that governments should bear in mind:

Know where the value is and where the jobs are

The first imperative for policy makers is to gain detailed knowledge of the resources supply chain so that they understand where the value is in terms of revenue and employment. This is necessary to determine what share of that value could realistically be captured locally without harming the competitiveness of the resources sector. As part of this process, it is important not only to look at the domestic market but also to understand opportunities to supply regional and global value chains.

To understand the potential of various value pools, we split expenditure into ten general categories across goods, services, and utilities (Exhibit 22). Goods include basic materials (high-frequency consumables and basic materials such as steel and cement); low- to medium-complexity equipment and parts (semi-commoditized equipment and parts of low to medium complexity, such as pumps, explosives, and chemicals); high-complexity equipment and parts (original high-tech/high-complexity equipment such as conveyer belts and trucks); and integrated plant equipment solutions (complete processing systems such as crusher mills and locomotives). Services include manual and low-skilled labor (entry-level roles such as operators and security services); medium-skilled labor (basic technical and business service roles such as foreman, shift boss, or artisan); technical support services (high-end services requiring specialized skills and with high entry barriers, such as mine planner, geologist, and engineer); business support services (labor involved in indirect operational activities, such as human resources and finance); and management (including engineering, procurement, and construction management). Utility services include fuel, power, and water.

In each of these categories, we examined spending and employment patterns from initial exploration and feasibility studies to the development of the site, production, and finally closure. In mining, our analysis shows that the production phase is by far the most significant in terms of undiscounted nominal spending, accounting for between 75 and 90 percent of the total (depending on the specific metal and type of mine considered). Development and construction of the site accounts for between 10 and 25 percent of the total cost.

This analysis clearly implies that governments should focus on the production phase if they want increased local content because this is when the bulk of spending takes place. In addition, while local-content opportunities from construction are generally “one-off” and concentrated in a relatively short time, opportunities in production typically recur over a longer period, which allows local suppliers to develop and improve their capabilities gradually rather than having to deliver very quickly on construction spending, for instance. In the production phase of mining projects, the largest spending categories are manual and low-skilled labor; basic materials (such as steel and cement); management, and engineering, procurement, and construction management (EPCM); business support services; and utilities.

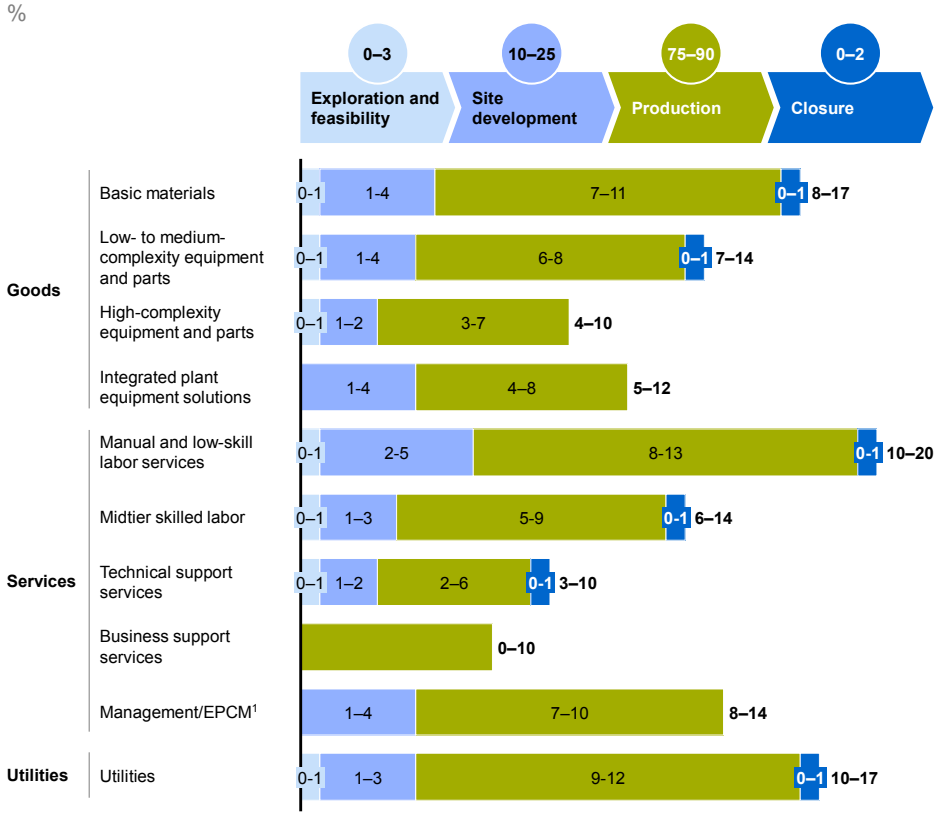
Exhibit 22

About 75 to 90 percent of mining spending is in the production stage

Share of life of mine cost

%

MINING EXAMPLE



1 Engineering, procurement, and construction management.

NOTE: Analysis based on expert interviews and quantitative estimates of capital and operational expenditure over the life of a mine. Figures are subject to variation according to the specific metal and type of mine considered. The totals shown for each element of the mine life cycle will therefore not necessarily equal the sum of the individual items below.

SOURCE: McKinsey Global Institute analysis

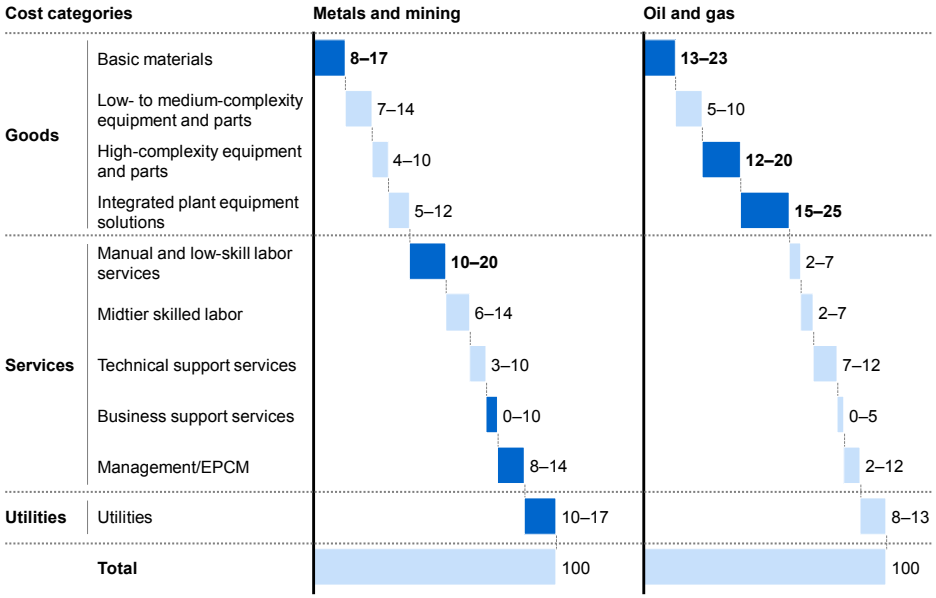
The patterns of spending in the case of oil and gas projects are different from those in mining. Oil and gas tend to be highly capital-intensive and require higher-skilled labor than typical mining operations (Exhibit 23). As a result, a much larger share of total procurement is spent on integrated plant equipment solutions and a much lower share on manual and low-skilled labor.

Exhibit 23

Mining and oil and gas expenditure varies across categories

Cost breakdown by cost type

%



SOURCE: Energy Insights; McKinsey Global Institute analysis

In addition to understanding the profile of spending, it is important for governments to have a handle on the potential for job creation—despite the fact that the resources sector is not nearly as labor-intensive as, say, agriculture or manufacturing. Governments then need to establish the employment potential associated with each spending category and how much of that employment potential can be captured locally. This varies among the ten categories of spending.

Understand the competitive edge

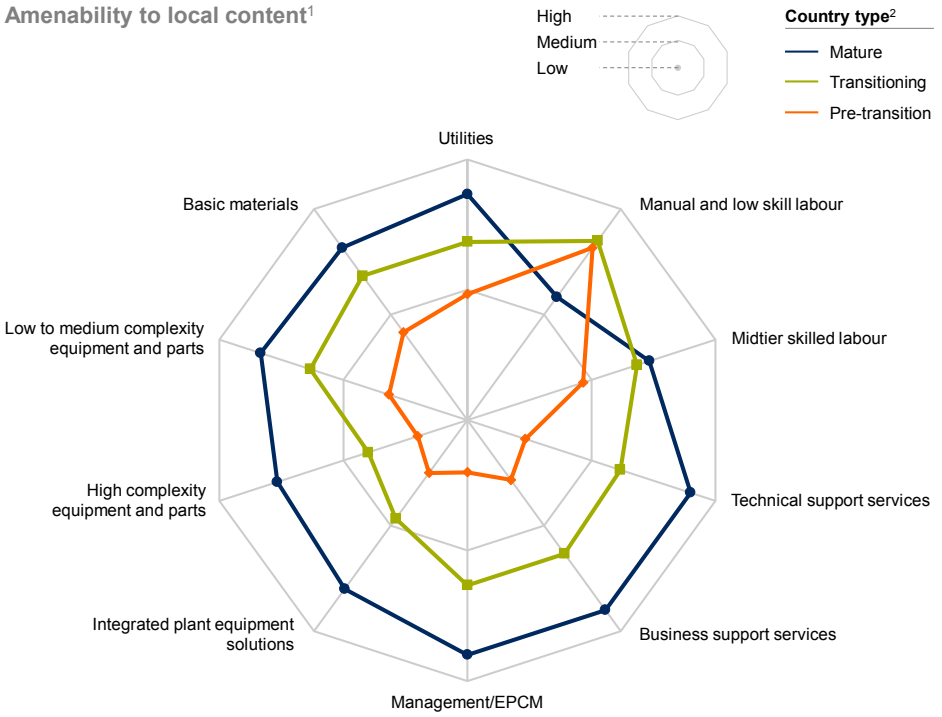
The spending that can be captured locally varies significantly per country due to a number of factors including the type of resource, the level of industrialization, and the country's unique aspects such as location, language, and whether other industries have a significant presence (Exhibit 24). Some of the largest categories, including manual and low-skilled labor and basic materials, can be localized easily even in countries with low levels of development and industrialization. Other categories, such as high-complexity equipment, can be localized only in certain countries. In Western Australia, roughly 90 percent of total spending in the production stage is potentially amenable to local content in mining, as is a slightly lower share in oil and gas.[121] In the case of South Africa, based on expert interviews we estimate that 70 to 80 percent of mining spending is amenable to local content. In underdeveloped countries that have not yet industrialized and that have relatively new resources sectors—Guinea being an example—very little overall spending is amenable to local content, at least initially.

Exhibit 24

Countries vary in terms of the amenability of their supply chain to local content

MINING EXAMPLE

Amenability to local content[1]



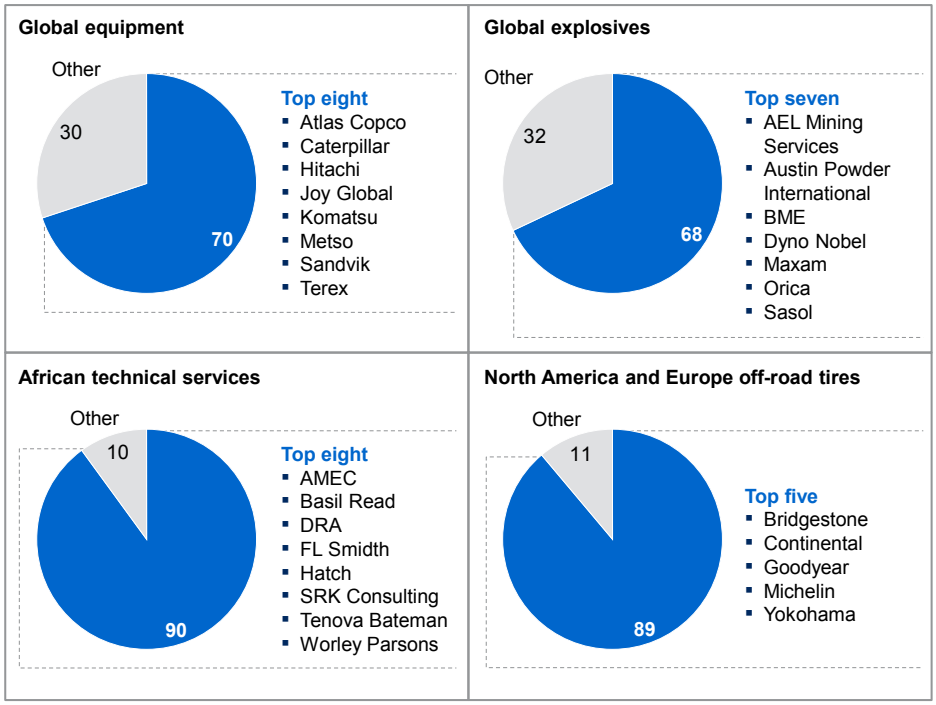
1 Based on assessment by McKinsey and external experts.
2 Country type reflects the level of sophistication of the local supply chain. "Mature" countries have a high skill base and relatively sophisticated supply (e.g., Canada, Australia, Norway. "Transitioning" countries have medium level of supply chain sophistication (e.g., Peru, South Africa, Botswana). "Pre-transition" countries have a relatively low skill base and low level of supply-chain development (e.g., (Guinea, Democratic Republic of the Congo, Mozambique).

SOURCE: Expert interviews; McKinsey Global Institute analysis

121 Ian Satchwell, *Building mining services clusters in Australia*, International Mining for Development Centre, May 2012.

It is not easy to build a world-class local industry. The market is often dominated by only a handful of global competitive players. In mining, for example, the top eight equipment manufacturers—including Komatsu and Caterpillar—have a combined market share of about 70 percent (Exhibit 25). In oil and gas, the upstream subsectors of piping inspection and coating, contract compression services, and logging drilling and defiling all have very high concentration. For local companies to compete, they will need some form of competitive advantage and a solid development plan that plots out a course over 20 years or more.

Exhibit 25
The market is led by a handful of large players in niche areas
Market share
%



SOURCE: Company websites; Xerfi Global; Freedonia Group; expert interviews; McKinsey Global Institute analysis

Building a globally competitive industry and labor force is crucial to the successful development of local content, at least in the medium to long term. Nordic countries are excellent examples of this. Finland and Sweden's hard-rock mining sectors have become leaders in supplying equipment and technical services, despite the fact that there is a limited amount of such mining domestically.[122] Nordic countries have some of the world's largest equipment manufacturers, including Outotec, Metso, and Sandvik.

122 *Sweden minerals strategy*, Government Offices of Sweden, 2012; *Finland's minerals strategy*, Geological Survey of Finland, 2010.

How did Swedish and Finnish firms manage to become world leaders in this industry? At the core of their success is the fact that Nordic mining companies have developed expertise operating in particularly harsh conditions, working hard to put in place extensive training and encouraging an attitude of continual innovation. The industry in both countries forged close links with academia. The Luleå University of Technology in Sweden and the University of Oulu in Finland jointly established the Nordic Mining School and introduced their students to all aspects of mining and metallurgy.[123] Both countries also have very active R&D-supporting institutions. The Swedish government will invest an additional €25 million to 2016 to support "world-class research" in mining- and mineral-related areas and foster cooperation between the business sector and academic institutions, led by Vinnova, Sweden's Innovation Agency.[124] Finland's equivalent agency, Tekes, is contributing to a five-year mining program with €20 million of grants and loans to private companies and €10 million to public research institutes with the aim of making Finland a global leader in the sustainable use of mineral resources.[125] Such programs and institutions have enabled suppliers in Nordic mining to establish key positions along the value chain: for example, ABB and Sandvik in mine structures; Atlas Copco and Tamrock in drilling; Toro and Volvo in hauling; Metso and Sandvik in mineral processing; and Metso and Outotec in physical and chemical separation.

Carefully assess the opportunity cost of regulatory intervention

Once they have detailed information on spending, the potential for job creation, and how easy it is to localize these in the different categories of the value chain, governments need to assess whether regulations would unnecessarily raise costs and damage the competitiveness of extractive companies. They also need to ensure that such regulation doesn't create perverse incentives. For example, regulation that automatically gives contracts to any local provider bidding within 10 percent of the best price will discourage local firms from becoming competitive with multinationals. There are a number of useful principles to guide effective local-content policy, including the following:[126]

- **Understand consistency with free trade agreements.** Local-content regulations can potentially be in violation of free trade agreements if they give preferential treatment to local players. This can be particularly problematic for countries that are members of the World Trade Organization or have entered into bilateral trade agreements. For example, Canada's local-content requirements on wind turbines were successfully challenged by Japan.[127] It is therefore important for countries to understand the "boundary conditions" for any regulatory support provided to local players that arise from these trade agreements.

123 *Investment opportunities in mining North Sweden*, Vasterbotten Investment Agency, February 25, 2013.

124 *Sweden minerals strategy*, Government Offices of Sweden, 2012.

125 Tekes is the Finnish Funding Agency for Technology and Innovation. See Kari Keskinen, "Tekes green mining program," Tekes, April 3, 2013, and *Finland's minerals strategy*, Geological Survey of Finland, 2010, 2010.

126 For a more detailed discussion of some of these areas, see Silvana Tordo et al., *Local content policies in the oil and gas sector*, World Bank, July 2013.

127 Gary Clyde Hufbauer et al., *Local content requirements: A global problem*, Peterson Institute for International Economics, September 2013.

- **Create an opportunity-cost curve for job creation.** Creating additional jobs through local-content regulations in the resources sector could be an inefficient and expensive way of creating employment. Governments should therefore look at local content as only one option among several and ensure that the cost-benefit equation works relative to other approaches. For instance, it may be more cost-effective to stimulate tourism or agriculture than to stimulate local content. To understand these dynamics, a careful assessment of the opportunity cost across sectors and government departments would be useful. To accomplish this, one approach would to be to create an opportunity-cost curve for job creation, to ensure that appropriate investment is being made in jobs. This should consider not only the direct costs to government in supporting local content (for example, establishing training centers), but also the potential effects on the resources sector (such as changes in investment and tax revenues from impacting industry competitiveness) and the quality of the jobs created (where average wage levels can be used as a proxy). We are not aware of governments assessing the opportunity cost of local-content regulations.

- **Address practical barriers.** Local companies may not even be aware that opportunities are available, and governments need to overcome this information barrier. Many resource-driven countries have done so by creating online databases of procurement contracts. For example, the Kazakhstan Contract Agency Register was automated in 2010 to make procurement processes transparent to both local and international suppliers; oil and gas companies are required to upload all procurement information and documents. Brazil operates a similar system through the Site Opportunities Supply Chain of Petroleum and Natural Gas, launched in 2009. Private-sector companies have put in place similar initiatives. Another barrier for local companies is their lack of scale. To overcome this, governments sometimes require companies to unbundle contracts into smaller packages so that local suppliers are able to fulfill them.

- **Promote competition and the emergence of an efficient domestic economy.** To counter the risk that local-content regulation compromises efficiency by giving preference to local suppliers, policy makers should consider sunset clauses on any support. When provisions expire, local suppliers are required to compete on an equal footing with international suppliers. For example, Norwegian legislation mandating local content was removed in 1994, ensuring that local service providers were fully exposed to international competition.

- **Ensure consistency with other economic development policies.** Local-content policies should be designed as part of a broader menu of economic development policies. For example, efforts to stimulate foreign investment, negotiate trade agreements, and ensure a stable macro-economy can help encourage local content.

Don't just regulate—enable

To encourage local content, it is important that governments play a number of enabling roles, as described below:

- **Build skills.** Governments need to support industry's development by building industrial and vocational skills. Brazil and Malaysia, for example, have put a strong focus on improving the quality and quantity of technical skills in the oil and gas sector. Brazil undertook an extensive effort to identify the skills required for developing the sector and addressed gaps in the local labor force by establishing centers and networks of excellence in universities.[128] In Malaysia, two pilot programs—the Pilot Internship Program for Engineering Consultancy Services and the National Talent Enhancement Program—provide tax incentives for participating companies to provide on-the-job training. In addition to targeted skills development programs, there is often significant scope to piggyback on skills already developed in other industries. The Norwegian government, for example, deliberately brought skills and expertise from industries including shipbuilding into the resources sector. It is important for governments to initiate skill development planning ahead of potential resource booms to avoid competition over scarce qualified labor that can result in significant price distortions.

  Many resource-driven countries require extractive companies to direct a certain share of revenue to local R&D.[129] In Malaysia, for example, every production-sharing contractor is subject to an annual research contribution equivalent to 0.5 percent of the sum of costs and the contractor's share of profits. Brazil has adopted a similar approach, requiring operators to invest 1 percent of each field's gross revenue on oil- and gas-related R&D. Another effective approach that has been used in Norway, Malaysia, and some other resource-driven countries has been to build local capabilities through pooling company resources and supporting "clustered allied industries." This helps to create a network of mobile labor and supports interaction among suppliers. State-owned resource companies may be mandated to support the development of these clusters.

- **Aggregate long-term demand.** Local investors and entrepreneurs need to have a clear idea of likely future revenue streams if they are to be persuaded to put money into developing a new supply industry. One way of making it worthwhile for these players to start committing funds to the resources sector—and overcoming their small scale—is for the government to help aggregate demand for their input. This means adding up the goods and services needed for multiple projects in the country (or in the region), and therefore providing scale and transparency to long-term demand for goods and services. By creating scale and grouping the requirements of mining companies and civil works, the government of Morocco was able to create a need that could attract suppliers of medium-complexity goods to the country.

128 Lisa Manrique, *Brazil's education system falls behind*, Centre for Strategic and International Studies, 2010.

129 David T. Coe, Ethanan Helpman, and Alexander W. Hoffmaister, *International R&D spillovers and institutions*, IMF working paper number 08/104, 2008.

- **Provide funding for expansion of local industry.** Funding can often be a constraint for local companies. Governments can overcome this constraint by bridging any gap through public institutions that provide low-interest loans to local entrepreneurs along with advice about how to develop their businesses. One of the responsibilities of Brazil's Program for the Mobilization of the Oil and Gas Industry (PROMINP) is providing small-scale financing to local companies. In Kazakhstan, local commodity producers are supported through co-financing of plants and provision of long-term orders for overhauling, servicing, and troubleshooting.

Track and enforce progress

It is often difficult for policy makers to monitor the implementation and impact of local-content policies. A few general principles, described below, can be helpful:

- **Make procedures simple.** Regulation and targets should be as straightforward as possible. Standardized reporting is important. In Kazakhstan, local-content policies introduced in the 1995 Petroleum Law had vague requirements that gave companies discretion in how they implemented them, but this led to uneven reporting and difficulties in monitoring compliance. Changes to the law in 2010 have resulted in a more unified and streamlined approach. Brazil has formulated a standard FPSO design to make it easier to produce and monitor.

- **Create incentives to enforce compliance.** Typically, businesses weigh the cost of compliance against the likely cost of not complying. For this reason, it is important that the cost of compliance is not too high, and that non-compliance costs more because it carries sufficient penalties. Academic evidence shows that the track record of the regulator has an important influence on overall compliance.[130]

- **Coordinate government action.** It could be useful to have a new regulatory body to coordinate processes (see Box 7, "Brazil: From local-content regulation to local capabilities" for an example of how this can be done).

- **Allow for complaints and improve regulation.** Local-content regulation can have severe unintended consequences. Creating a body that allows for appeal on existing regulations and acting on those appeals creates more fair and efficient local-content legislation.

130 S. James, *Incentives and investments: Evidence and policy implications*, World Bank, December 2009.

Box 7. Brazil: From local-content regulation to local capabilities

Brazil has used growth in its oil and gas sector to enhance human capital, technology, and supporting institutions. In 1999, just 25 percent of exploration and production in the oil and gas sector relied on local content; that share had risen to about 70 percent by 2007.[1] The increase was achieved through a combination of measures:

- **Targets set at granular levels.** Brazil specified local-content requirements according to the complexity of an oil or gas field. It targets attractive value pools to ensure that they can be met and that they can be scaled up over time. A strict audit and monitoring process is in place to set targets that are ambitious but also realistic.

- **Stringent enforcement.** Enforcement is carried out by a specific regulatory body—the Agencia Nacional do Petroleo (ANP), which was created in 1997 to coordinate local-content policies in Brazil's oil and gas sector. The ANP sets guidelines for competitive licensing rounds and local-content requirements, monitors compliance, and enforces penalties when targets have not been achieved. Penalties for underachievement of local-content requirements range from 60 percent to 100 percent of the total value of a contract, depending on the extent of the shortfall.

- **Smaller contracts.** Engineering procurement and construction contracts are broken down into smaller, standardized orders that are more realistic for local firms to fulfill. ANP develops legislation to promote the participation of small companies and ensure their awareness of available opportunities.

- **Building skills.** Beyond regulatory measures, Brazil has taken steps to build long-term enablers. PROMINP was created to develop local professionals through manpower planning, national training programs, and a qualification registry.[2] The organization has also helped develop local supply chains by providing market information and financing for small enterprises. Partially state-owned Petrobras created an integrated staff-development program that offered MScs and PhDs to employees, while a world-class research center, Centro de Pesquisas Leopoldo Américo Miguez de Mello (CENPES), was set up to foster technological innovation.[3]

1 Nelson N. Filho, *The oil and gas industry in Brazil: The role of the regulator*, Agencia Nacional do Petroleo (ANP), May 2009.

2 Agencia Nacional do Petroleo (ANP).

3 Centro de Pesquisas Leopoldo Américo Miguez de Mello (CENPES).

PRIVATE COMPANIES PLAY A CRUCIAL ROLE IN LOCAL-CONTENT DEVELOPMENT

Thus far, we have focused on what governments can do to stimulate local content, but resource companies have a very important role to play, too. We have observed a number of cases in which a private company took the lead in developing local suppliers, not only to comply with local-content regulation but also to improve their performance. We see four broad imperatives for companies:

Understand the starting point

Private companies should first strive to understand their spending profile—present and future—and the availability of suppliers and potential suppliers. Rio Tinto, for example, compiled a detailed spending profile for its future Guinea project and conducted a detailed mapping of the local supplier base.[131] Social baseline studies can be useful. Newmont, for instance, uses social baseline studies to understand not only community needs but also what resources are available, where it might find partners and how to best put in place development programs.[132]

Organize for local content

Local content does not happen by itself. A structured local-content strategy is necessary to ensure its future development, which clearly prioritizes areas that are most amenable to local content and then organizes the business to deliver on them. The Moroccan phosphates company OCP developed a portfolio of target sectors based on an analysis of spending in around 80 sectors. It then compiled a target short list by looking at the GDP contribution of each sector and how easy it would be to localize content. OCP assumed that it would take a number of years to achieve an increase in the share of local content from 30 percent to 45 percent and that this would create about 12,000 jobs. The company opted to prioritize service sectors because they were more amenable to local content and had greater potential to create jobs. As a result of this effort, OCP initially focused on construction, maintenance, and engineering service providers. It decided to use four levers: engaging in joint ventures with international companies to ensure that Moroccan companies could borrow in skills and capabilities; establishing volume guarantees to minimize the risk to local suppliers; developing dedicated economic zones to enable greenfield and brownfield development; and creating transparency on the demand pipeline to minimize uncertainty.

In addition, an organization needs to be set up to ensure the structured development of local content. This approach must be rooted deeply in the company processes for procurement and human resources, and not within corporate social responsibility. OCP's program was supported by a dedicated localization office responsible for deal-making, program management, local content auditing, and reporting and communications.

131 *Simandou: Economic impact report*, Rio Tinto, May 2013.

132 "Community relationships," Newmont, 2012, www.beyondthemine.com.

Engage with government proactively

As Norway has illustrated, successful local content requires a cooperative approach between government and the private sector. The private sector is much more aware of the future spending profile, local availability of capabilities, and quality of the supply. The only way to design good policy is to ensure that policy makers are well informed and can make trade-offs based on the right information. A proactive approach in which the private sector takes the lead can be very successful. BHP Billiton helped the Chilean government to increase the ratio of exports to imports in the mining sector from 7 percent to 50 percent in only ten years. Crucial to this success was cooperation between the company and the government. BHP's objective was to elevate 250 local suppliers to "world-class" by 2020 and certify them as such. To do this, it launched a program in 2009 in Chile's Antofagasta region. The company chose seven key sectors that supplied its activities and targeted local suppliers in each. The program helped spur a number of improvements. For example, the lifetime of locally sourced digger cables improved by 40 percent. BHP was able to benefit from the government's creation of industrial development zones. The government benefited from transparency about the kind of skills it needed.[133]

Enable

Finally, companies can assume a number of enabling roles. Companies can play a major role in developing capabilities. BHP Billiton finances mentoring and technical training for local SMEs in order to transform them into world-class suppliers.[134] Petrobras has invested strongly in targeted skills and technical training since 1960 and has trained 2,800 qualified mining engineers.[135] Companies can also help to finance the development of suppliers. In 2011, Anglo American's Zimele program invested about $125 million to give opportunities to disadvantaged South Africans, focusing on aspects such as procurement and business development opportunities as well as the mitigation of environmental risks in the areas where Anglo American operates.[136] The promotion of R&D is another enabling role companies should play. Large multinational companies can also help to develop a local supply chain by setting specific key performance indicators and pushing their suppliers to perform against them. BHP, as we have noted, successfully implemented a rating and certification system for local suppliers in Chile and offered operational support for small and medium-sized enterprises. As a result, the company's suppliers have been able to step up their activities with BHP and even with its competitors.

133 *Fostering local supplier development*, BHP Billiton, 2012.

134 *Petroleum Health, Safety, Environment, and Community Controls*, BHP Billiton, 2013.

135 D. Peyerl, *Oil professionals training in Brazil: The role of Petrobras in the formation of a national class of geoscientists*, Universidade Estadual de Campinas, Brazil, 2013.

136 "Sustainable development: Zimele," Anglo American, www.angloamerican.co.za/sustainable-development/anglo-zimele.aspx.

Spending the windfall

The effective national management of natural resource wealth is a huge challenge. History is littered with examples of resource windfalls being misused (see Box 8, "The corruption challenge in resource-driven countries"). Misappropriation of funds by political leaders has unfortunately been rather common, from the siphoning of up to $3 billion of oil revenue by Nigeria's then-military ruler, General Sani Abacha, in the mid-1990s to himself, his family, and associates, to the appropriation of oil revenue by Iraq's then-leader, Saddam Hussein, for the personal gain of himself and his family.[137] More recently, a Zimbabwean parliamentary report found that huge revenue from diamond mining had never found its way to the national treasury.[138] Even where there is no misappropriation or theft, governments have spent resource wealth inefficiently and unwisely. Iran and Venezuela, for instance, used their abundance of oil to heavily subsidize petrol, but this led to constraints on supply and smuggling. These instances only underline the importance of finding mechanisms to ensure that resource windfalls are spent wisely.

THERE ARE FIVE BROAD WAYS TO SPEND RESOURCES REVENUE

There are broadly five ways to use a resource windfall, and many countries use a combination of all of them.

Invest the money abroad

Some countries have used a state-owned investment fund to invest a portion of their resource windfall overseas.[139] MGI research has shown that sovereign wealth funds worldwide controlled an estimated $5.6 trillion at the end of 2012 and that 57 percent of this came from funds largely derived from natural resource production (Exhibit 26).[140]

137 "Nigeria says Liechtenstein making excuses to keep Abacha loot," Reuters, October 14, 2013.

138 "Zimbabwean politician behind diamond royalties report killed in car crash," *The Telegraph*, June 21, 2013.

139 Such approaches are consistent with the permanent income hypothesis (PIH), which holds that a country should sustain a constant consumption flow equal to the (implicit) return on the present value of future natural resources revenue. However, Collier et al. (2010) have suggested that such a rule is inappropriate for developing countries where the marginal social value of an incremental dollar of consumption today is likely to be high (relative to the future when the economy is hopefully more developed). This rule also ignores liquidity constraints and the impact of uncertainty. For further details, see *Macroeconomic policy frameworks for resource-rich developing countries*, IMF, August 2012.

140 There are 61 sovereign wealth funds in the MGI capital markets database. The exhibit shows data for the 25 largest funds.

Box 8. The corruption challenge in resource-driven countries

Corruption remains a significant problem for resource-driven countries. These countries typically perform relatively poorly on Transparency International's Corruption Perceptions Index. The resource-driven countries we discuss in this report have an average reading of 35 on the index, ranking them collectively at 102 (out of 176 countries). The Revenue Watch Institute's 2013 Resource Governance Index (RGI) measures the quality of governance in the oil and gas and mining sectors of 58 countries, which together produce 85 percent of the world's petroleum, 90 percent of its diamonds, and 80 percent of its copper.[1] In the 2013 RGI, only 11 of the countries—less than one in five—had satisfactory standards of transparency and accountability. Corruption manifests itself in a variety of ways along the extractive value chain, including the following:

- **Award of contract and licenses.** The process of choosing a contractor for a resource-extraction project is susceptible to significant potential for corruption. The Africa Progress Panel, a research organization chaired by former United Nations secretary-general Kofi Annan, estimates that the Democratic Republic of the Congo has lost at least $1.35 billion from five mining deals since 2010, equivalent to double the country's annual combined spending on health and education.[2]

- **Regulation and monitoring of operations.** There can be a risk of corruption even when no large contracts are available but there are still regular interactions with government regulators and institutions. Officials may solicit bribes to do their jobs more quickly; companies may offer bribes to persuade officials to turn a blind eye to environmental or social malpractice or even to under-report output in order to reduce taxes and royalties. But it can be difficult to define corruption in this area. The *Financial Times* reports that an unidentified London mining company flew the mayor of a town in Chile to a copper mine in a remote part of the country and paid for transport, food, and accommodation.[3] The mayor was a stakeholder who needed to understand the project, but, under anticorruption legislation such as the UK Bribery Act, this type of activity could be prohibited.

1 *The 2013 resource governance index*, Revenue Watch Institute, May 2013.

2 *Equity in extractives Africa: Stewarding Africa's natural resources for all*, African Progress Report, Africa Progress Panel, May 2013.

3 "Mining and oil groups dig in for bribery act," *Financial Times*, September 13, 2010.

Box 8. The corruption challenge in resource-driven countries (continued)

- **Collection of payment and taxes.** Another potentially risky time is when extractive companies pay taxes or pay for land rights in cases that lack full transparency. There have been many instances of discrepancies between what companies pay and what governments claim they receive. In the case of Cameroon, one 2009 study estimated oil revenue between 1977 and 2006 and compared it with what was officially reported in the government's budget. The study found that it could not account for an estimated 54 percent of oil revenue during this period.[4]

- **Revenue spending on development projects.** A great deal of spending is often wasted at the development stage of an extraction project because many resource-driven countries do not have sufficient capacity to manage financial flows effectively. The poor design of government procurement regulations is another source of corruption. For example, the former chief executive officer of the Bolivian state oil company was found guilty of accepting a $450,000 bribe from a company in exchange for awarding an $86 million contract to build a liquefied petroleum gas plant in 2009.

Many initiatives have attempted to tackle corruption. At the global level, a notable example is the Extractive Industries Transparency Initiative (EITI), which focuses on ensuring transparency of monetary transfers between government and private companies. In the United States, the Dodd-Frank Wall Street Reform and Consumer Protection Act, which went into effect in July 2010, strengthened transparency requirements for companies. In the European Union (EU), new laws require European companies to report payments of more than €100,000 made to the government in any country in which they operate, including taxes levied on their income, production or profits, royalties, and license fees. Between them, US law and EU directives cover about 70 percent of the value of the global extractive industries.

At the national level, too, there have been promising developments. Mozambique is strengthening its anticorruption laws to help protect whistle-blowers and criminalize various corrupt practices.[5] In Uganda, the finance ministry sends details to the local media of all the money each school receives from the state. This has resulted in 90 percent of non-salary funding actually getting to the schools, compared with around 20 percent in the past. The finance ministry in Nigeria launched an even broader initiative of this kind in 2003 that covered all funds released to state governments.[6] Scaling up such initiatives to cover more companies and countries is a crucial part of ensuring that resource windfalls are not wasted.

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4 B. Gauthier and A. Zeufack, *Governance and oil revenues in Cameroon*, Revenue Watch Institute, OxCARRE research paper number 38, October 7, 2009.

5 *DFID's anticorruption strategy for Mozambique*, Department for International Development, January 2013.

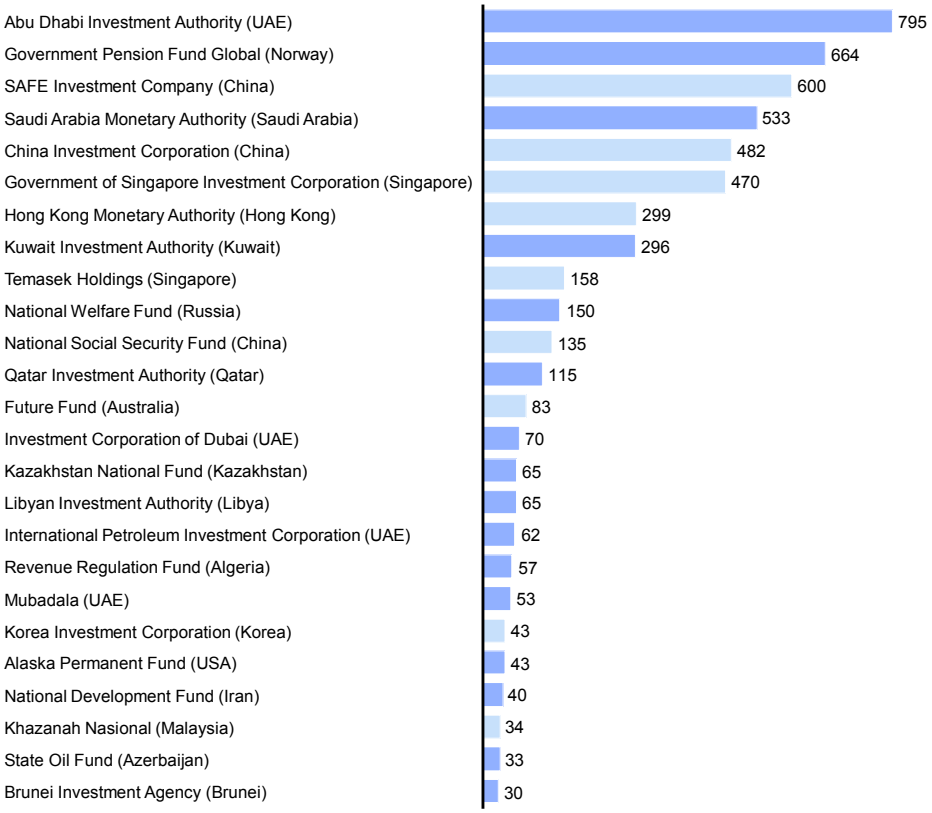
6 Paul Collier, *The bottom billion: Why the poorest countries are failing and what can be done about it*, Oxford University Press, 2008.

Exhibit 26

The world's largest sovereign wealth funds

Total estimated assets under management

$ billion, 2012[1]


Resource-related
Abu Dhabi Investment Authority (UAE) 795
Government Pension Fund Global (Norway) 664
SAFE Investment Company (China) 600
Saudi Arabia Monetary Authority (Saudi Arabia) 533
China Investment Corporation (China) 482
Government of Singapore Investment Corporation (Singapore) 470
Hong Kong Monetary Authority (Hong Kong) 299
Kuwait Investment Authority (Kuwait) 296
Temasek Holdings (Singapore) 158
National Welfare Fund (Russia) 150
National Social Security Fund (China) 135
Qatar Investment Authority (Qatar) 115
Future Fund (Australia) 83
Investment Corporation of Dubai (UAE) 70
Kazakhstan National Fund (Kazakhstan) 65
Libyan Investment Authority (Libya) 65
International Petroleum Investment Corporation (UAE) 62
Revenue Regulation Fund (Algeria) 57
Mubadala (UAE) 53
Korea Investment Corporation (Korea) 43
Alaska Permanent Fund (USA) 43
National Development Fund (Iran) 40
Khazanah Nasional (Malaysia) 34
State Oil Fund (Azerbaijan) 33
Brunei Investment Agency (Brunei) 30

1 Based on nominal exchange rates. The 25 funds with the largest assets under management are shown here.
SOURCE: McKinsey Global Institute capital markets database; McKinsey Global Institute analysis

The challenge with both types of fund is ensuring that there is sufficient scrutiny to avoid the mismanagement or misappropriation of money. Cameroon established a dedicated overseas fund into which it paid oil revenue, but, in the absence of robust checks and balances, most of the funds were lost to corruption.[141] Critical safeguards, including regulation mandating transparency and accountability, are necessary to ensure that funds are invested appropriately.

141 Paul Collier and Anthony J. Venables, eds., *Plundered nations? Successes and failures in natural resource extraction*, Palgrave, 2011.

Invest the money domestically

Another approach is investing a share of resources revenue at home, in infrastructure and other key areas. Botswana's Sustainable Budget Index, for instance, earmarks mining revenue for specific economic development priorities including education and health. Economist Paul Collier is one prominent advocate of this approach. He argues that capital is scarce in many resource-driven economies and therefore that domestic investment can potentially offer high returns.[142] The challenge with this analysis is that the domestic economy may have limited capacity to absorb such an influx of funds effectively. For instance, there may not be sufficient expertise in the public sector to select and manage large investment projects, and there is a risk of corruption. If investment is scaled up quickly, which is often the case after a resources windfall, capacity constraints such as supply bottlenecks or poor planning can result in low returns on investment.[143] Academic studies have found that, in some developing countries, less than half of investment expenditure translates into improvements in public capital.[144] There is also a risk that spending can amplify macroeconomic volatility if the spending is too closely linked to resource prices and the economic cycle. This can also result in Dutch disease concerns by supporting exchange-rate appreciation and domestic cost inflation, making other export sectors, such as manufacturing, less competitive in global markets.

Allocate the money to specific regional areas

Some countries direct a share of resources revenue to investment and consumption in specific regions. Brazil splits its disbursement of CFEM mining royalties in the following way: 65 percent to local governments, 23 percent to mining states, and the remainder to the National Department of Mineral Production. The advantage of this approach is that it can help to ensure that local communities see the benefits, and not just the costs, of mining activity. However, this does leave the way open for high levels of corruption because it may be more difficult to put in place the right safeguards at the local level. Moreover, weak governance capacity locally could lead to poor choices about how the money is spent.

142 Ibid.

143 Paul Collier et al., "Managing resource revenues in developing economies," *IMF Staff Papers*, volume 57, issue 1, April 2010.

144 Christophe Hurlin and Florence Arestoff, "Are public investment efficient in creating capital stocks in developing countries?" *Economics Bulletin*, volume 30, issue 4, 2010.

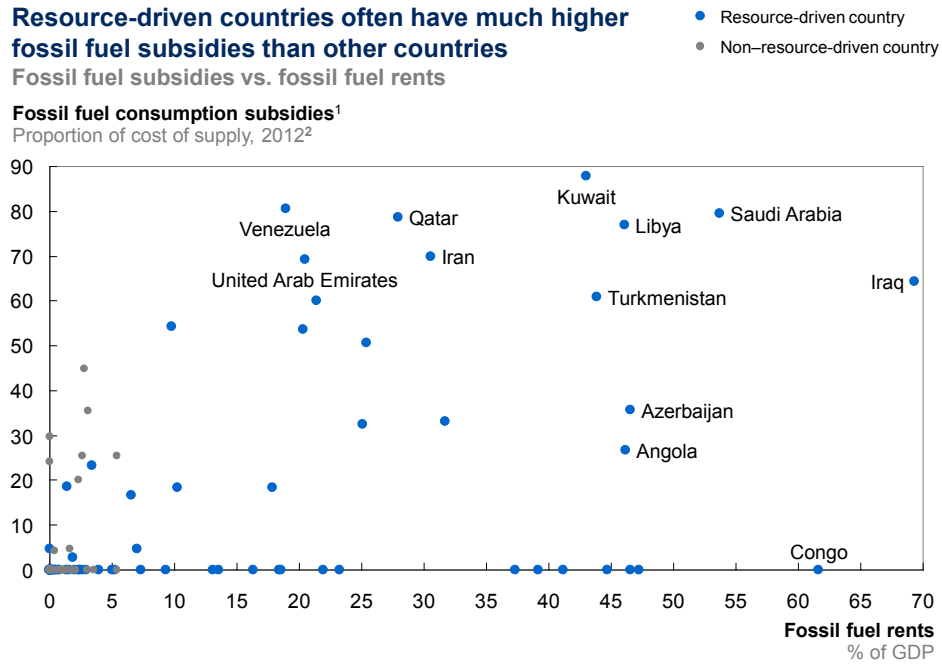
Consume the money or resources in the domestic economy

A fourth option is for government to use resources revenue for a broad swath of domestic spending including, for instance, higher wages for public-sector workers, subsidies on energy, or other welfare payments. If a country is very poor, the value to society of spending some share of the resource windfall is likely to be high; this is less the case in the future when the hope is that incomes would be higher.[145] While there is a good case for spending some of the revenue on consumption in poor countries, there is still an issue in many resource-driven countries where consumption spending is poorly used. We would argue that high energy subsidies are such a case. Nearly two-thirds of countries with energy subsidies are resource-driven (Exhibit 27). The IEA estimates that $523 billion was spent globally in 2011 on subsidies for fossil fuel consumption, and it noted that this spending is regressive; only about 8 percent goes to the bottom 20 percent of the population (see Box 9, "The resource efficiency imperative for resource-driven countries"). The opportunity cost of these subsidies can be high. Saudi Aramco CEO Khalid al-Falih warned that rising domestic energy consumption supported by heavy energy subsidies could result in the loss of three million barrels per day of crude oil exports—or over one-quarter of current production—by the end of the decade if current trends persist.[146] A further risk is that money is wasted and contributes to unsustainable spending. The example of Zambia constructing an elaborate welfare state during the copper boom but then having to dismantle it when copper prices fell is a case in point.[147]

Exhibit 27

Resource-driven countries often have much higher fossil fuel subsidies than other countries

Fossil fuel subsidies vs. fossil fuel rents



1 Subsidies to fossil fuels that are consumed directly by end-users or consumed as inputs to electricity generation.
2 Based on the price of a product at the nearest international hub, adjusted for quality differences if necessary, plus or minus (depending on whether country is exporter or importer) the cost of freight and insurance, plus the cost of internal distribution and marketing and any value-added tax (VAT).

SOURCE: International Energy Agency; World Bank; McKinsey Global Institute analysis

145 Paul Collier et al., "Managing resource revenues in developing economies," *IMF Staff Papers*, volume 57, issue 1, April 2010.

146 *Saudi Arabia update*, US Energy Information Administration, February 26, 2013.

147 Paul Collier and Anthony J. Venables, eds., *Plundered nations? Successes and failures in natural resource extraction*, Palgrave, 2011.

Box 9. The resource efficiency imperative for resource-driven countries

Resource-driven countries can too easily become excessive users of their resource wealth. Even when their endowments are very large, there is an imperative to use them efficiently.

Previous MGI research has identified a global opportunity to reduce primary energy use by 22 percent globally. Much of this potential is in energy-producing countries that are also often the most voracious consumers of energy.[1] One of the largest opportunities is raising the energy efficiency of buildings. In transport, there is scope to reduce domestic fuel use by shifting to public transport, promoting higher building density in cities, and increasing the fuel efficiency on motor vehicles. In industry, recovery rates in coal and oil could be greatly improved. For instance, the mechanization of small coal mines in developing countries could improve recovery by 50 percent. In oil, practices such as pumping carbon dioxide through the well during the drilling process could lengthen the lifetime of wells. In iron and steel, there is scope to capture and reuse waste heat. Coke dry quenching can capture up to 75 kilowatt hours of electricity per ton of steel capacity. Steel producers can boost energy efficiency through coal moisture control, controlled oxygen levels, and pulverized coal injection.

Removing subsidies, which encourage the excessive use of resources, is vital. Across resources, $1.1 trillion is spent on subsidies worldwide. Eight countries—Egypt, Iran, Iraq, Kuwait, Saudi Arabia, Turkmenistan, the United Arab Emirates, and Uzbekistan—spend more than 5 percent of their GDP on energy subsidies. In Iran, such subsidies totaled $101 billion, one-third of the country's central energy budget. On average, consumers in subsidized economies pay 81 percent of the competitive market reference price for oil products and only 49 percent of the reference price for natural gas.

Although removing such financial support is not always politically easy, the experience of countries that have done so offers some useful lessons. One lesson is that phasing out subsidies gradually allows people to adjust. While Bolivia faced a public backlash when it suddenly changed the price of fuel, Germany avoided political opposition by gradually reducing subsidies in coal mining.[2] Providing welfare support for the most vulnerable is another effective approach. Indonesia put in place a conditional cash transfer program to help cushion low-income households from the removal of kerosene subsidies.[3] Jordan supported subsidy reform by increasing the minimum wage and increasing the salaries of low-paid public-sector workers. Running public information campaigns can help citizens understand why reform is necessary and how money can be redirected to other services or to help reduce taxes. Transparency also helps. Chile has a strong record of transparency on subsidies and pricing policies that has helped citizens to understand price fluctuations and accept liberalization. Perhaps most importantly, any reform needs to be monitored continuously to ensure that measures are effective, negative consequences are noted, assistance programs reach those who need them, and policies are adapted as needed.

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1 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and the McKinsey Sustainability & Resource Productivity Practice, November 2011.

2 *Reforming energy subsidies*, UN Environment Program, 2002.

3 *A citizen's guide to energy subsidies in Indonesia*, International Institute for Sustainable Development, 2011.

Direct transfers to citizens

A fifth approach is the direct transfer of resources revenue to citizens. More than 40 countries have implemented some kind of cash transfer program. The Alaska Permanent Fund Corporation was established in 1976 with the aim of investing at least 25 percent of the state's oil revenue in a dedicated fund for future generations who may not benefit from oil revenue. The funds are invested, and each year every citizen receives a share of the dividends in the form of cash payments. The amount is calculated using an average of the fund's earnings over the previous five years. The taxable dividend check was $878 per person in 2012; the highest annual payout was $2,069 in 2008.

Beyond potentially helping to alleviate poverty, there are two main advantages of this approach. First, it can encourage investment in human capital. In the case of programs such as Oportunidades in Mexico and Bolsa Familia in Brazil, recipients need to meet conditions to access the money, such as ensuring their children attend school or having family members get regular health checkups. Bolsa Familia led to a significant increase in school attendance.[148] Second, if the disbursed money is taxed, these direct payments can lead to a social contract between the people and the state that didn't exist previously. When people don't pay tax, they don't hold their governments accountable in the same way that taxpayers do. This compact can encourage tax authorities to build a transparent system.[149]

However, there are also three significant challenges that make it difficult for such schemes to work effectively. The first of these is operational. Governments need to have a reliable way to identify recipients and an efficient channel for transferring money that minimizes both costs and opportunities for corruption. To this end, about half of social transfer programs launched over the past decade use electronic payments.[150] The second, potentially more serious, challenge relates to managing societal expectations. There is a risk that governments find themselves locked into a permanent welfare program that they cannot support, while citizens use the money for consumption, rather than investing or saving, because they think the funds are permanent. In Mongolia, for example, the government has a large fiscal deficit of 8.4 percent of GDP, the highest level in the past 13 years, due to rapid spending increases on items such as universal cash handouts, as well as payments to sectors such as the wool and cashmere industries.[151] The third challenge is that this increased spending can fuel inflation. In an extreme case, much of the value could be captured by the owners of assets such as housing whose prices are rising because supply is limited, leaving average citizens with little improvement in their living standards.

148 Eliana Cardoso and Andre Portela Souza, *The impact of cash transfers on child labor and school attendance in Brazil*, Vanderbilt University Department of Economics working paper number 0407, 2004.

149 Todd Moss, ed., *The governor's solution: How Alaska's oil dividend could work in Iraq and other oil-rich countries*, Center for Global Development, 2012.

150 Todd Moss, *Oil to cash: Fighting the resource curse through cash transfers*, Center for Global Development, working paper number 237, January 2011.

151 *Mongolia: Economic update*, World Bank Group, April 2013.

SIX BROAD PRINCIPLES CAN GUIDE EFFECTIVE SPENDING OF RESOURCES REVENUE

While the best approach to spending the windfall may vary somewhat depending on the country, there are some valuable lessons from experience, described below, that are broadly applicable:

- **Set expectations.** To counter pressure from citizens that could lead to wasteful spending, governments need to agree with them early on the principles for how resource wealth will be used and manage their expectations. Failing to do so can rapidly lead to problems. In 2012, for example, an oil company prospecting in northern Kenya announced a discovery. At that time, it was not known whether the discovery was commercially viable, and, in any case, it would take four years to go into production. However, shortly after the discovery, public-sector unions started campaigning for a large wage increase.[152] Managing a communications strategy needs to move beyond outlining an overall national vision to developing an understanding of how to achieve it and how spending resources rents can fit into the whole picture. In Ghana, the government undertook an extensive consultative exercise to discuss how to use the country's oil wealth and, interestingly, it was the country's poorest regions that were the most keen on saving funds.[153] Using basic facts to frame expectations can be useful. For example, in 2013 the local press in Liberia reported that ExxonMobil had paid the government $50 million as a signature bonus for prospecting rights. While this amount seemed large, it was equivalent to just $12 per person.[154] The communication also needs to preempt public opinion to keep inflated expectations from setting in. In Tanzania, for example, citizens learned about offshore gas discoveries not from government announcements but from a stock market announcement on Twitter. The original information quickly became distorted into rumors suggesting that each household would receive an envelope containing $200 a month. Local young people started claiming, "We don't need to work anymore." In contrast, when Botswana discovered its diamond wealth, the government quickly spread the message, "We're poor and therefore we must carry a heavy load." This mantra helped the government to win public support for investing the windfall rather than spending it.[155]

- **Ensure spending is transparent and benefits are visible.** Governments need to ensure that their use of funds is transparent and that citizens can see tangible evidence of the benefits these funds are creating. In Botswana, people can clearly see spending going to education and health. Since the 1980s, the government's Sustainable Budget Index has monitored whether mineral revenue is being used to promote sustainable development and finance "investment expenditure," defined as development and recurrent spending on education and health.[156]

152 Paul Collier, "We've struck oil! Citizen communication of resource discoveries," *Finance and Development*, December 2013 (forthcoming).

153 Joe Amoako-Tuffour, *Public participation in the making of Ghana's petroleum revenue management law*, Natural Resource Charter Technical Advisory Group, October 2011.

154 Paul Collier, "We've struck oil! Citizen communication of resource discoveries," *Finance and Development*, December 2013 (forthcoming).

155 Ibid.

156 *Towards mineral accounts for Botswana*, Department of Environmental Affairs, May 2007.

- **Smooth government expenditure.** Setting a target for the non-commodity government budget balance can insulate the budget from the volatility of commodity revenue. During periods of relatively high commodity prices or output, the overall budget might accumulate a surplus, and during periods of low prices or output, a deficit. While the budget may be in deficit, spending would remain intact. For example, Chile has established a budget balance rule, defined in structural terms, that includes provisions that correct for deviations in the prices of copper and molybdenum from their long-term levels as judged by an independent panel of experts.[157] Such fiscal rules can also establish targets for long-term savings. Norway established a fiscal rule in 2001 for the medium term that limits the structural non-oil deficit to the expected trend income from the sovereign wealth fund at an assumed real rate of return of 4 percent. This rule has led to budget surpluses averaging more than 10 percent of GDP since 2000.[158]

- **Keep government lean.** Resource-driven countries often suffer from bloated government bureaucracies. In Kuwait and the United Arab Emirates, for instance, more than 80 percent of employment is in the public sector. Pay raises can also be excessive; the Qatari government raised public salaries by 60 percent in 2012. Such features reduce not only public-sector productivity but also incentives for working in the private sector, inhibiting wider development. Governments need to be active in keeping the scope of the public sector in proportion by making regular comparisons of the public-sector size for each function with those of comparable countries. They should also continually learn to recognize duplicative structures and areas that they can consolidate.[159] One way to limit wage inflation in the public sector is to benchmark different types of jobs to their counterparts in the private sector. Governments should also assign public-sector roles a “clean wage” without hidden perks or privileges. There is much that governments can do to streamline public services by looking at every aspect of them to ensure that they are as efficient as possible, including the way people work.[160]

- **Shift from consumption to investment.** Channeling some of the resource wealth into domestic investment and savings is crucial to start transforming natural resource wealth into long-term prosperity. To support this, resource-driven countries need to establish institutional mechanisms to address any bias toward government consumption spending and deficits, enhance fiscal discipline, and raise the quality of debate and scrutiny. These mechanisms can be in the form of fiscal rules that stipulate what portion of resources revenue should be saved or invested, and independent institutions to monitor spending decisions. For example, in July 2012 Australia established its Parliamentary Budget Office to provide independent and non-partisan analysis of the budget cycle, fiscal policy, and the financial implications of budget proposals.

- **Boost domestic capabilities to use funds well.** When resource-driven countries invest domestically, they need to have sufficient know-how and capacity in government to do it well. The IMF and World Bank jointly produce

157 *Fiscal rules: Anchoring expectations for sustainable public finance*, IMF discussion paper, December 2009.

158 *Norway staff report for the 2013 Article IV consultation*, IMF, 2013.

159 *Transforming government performance through lean management,* McKinsey Center for Government, December 2012.

160 Ibid.

an index of public investment efficiency, enabling countries to track progress in this area.[161] Some of the key aspects on which governments need to focus are the appraisal, selection, implementation, and auditing of projects. Berg et al. (2012) propose a "sustainable investing" approach, in which public investment is scaled up gradually in line with institutional and absorptive capacity constraints.[162]

Economic development

Very few resource-driven economies have sustained strong GDP growth beyond the duration of a boom. Even those that appeared to be on healthier long-term trajectories have rarely managed to transform resource-driven growth into broader prosperity, as measured by MGI's economic performance scorecard. In particular, income equality often worsens, as the resources sector creates few direct jobs but, at the same time, creates opportunities for corruption and can undermine competitiveness in non-resource sectors that employ significant workers, such as manufacturing. But this doesn't mean that it is impossible to use resources to enhance long-term prosperity in the broadest sense. Nevertheless, doing so requires governments to focus on removing barriers to productivity.

MOST RESOURCE-DRIVEN COUNTRIES HAVE FOUND IT DIFFICULT TO SUSTAIN STRONG ECONOMIC GROWTH BEYOND TEMPORARY BOOMS

Most resource-driven countries have found it difficult to reap a permanent or at least a longer-lasting dividend from their endowments. Understanding why requires a closer look at the growth dynamics in these economies, particularly during and after a resources boom. Income growth in a given economy is the product of the following five factors:[163]

- **Terms of trade:** The effect of changing prices for imports and exports
- **Additional capital:** The increase in capital stock
- **Additional labor:** The increase in the total number of hours worked in the economy
- **Capital productivity:** The amount of output generated per unit of capital stock
- **Labor productivity:** The amount of output generated per hour worked

Countries typically go through three phases during a resource boom. In the first, when resource prices or rents rise from historical trends to their peak, income

161 Era Dabla-Norris et al., *Investing in public investment: An index of public investment efficiency*, IMF working paper number 11/37, 2010.

162 Andrew Berg et al., "Public investment in resource-abundant developing countries," IMF working paper number 12/274, November 2012.

163 This report uses a measure of income called gross domestic income (GDI), which includes the terms of trade. We focus on income rather than GDP in this report to reflect the reality that an economy earns more when it receives higher prices for its exports and that effective incomes are higher when goods that an economy imports become cheaper, giving consumers greater spending power.

growth is often driven by a combination of terms-of-trade improvements and additional investment in the resources sector. In contrast, there is often little increase in labor because much of the resources sector is capital-intensive. Capital productivity can often decline initially due to large investments in projects that have not yet reached production and a rush to extract resources as quickly as possible to take advantage of boom conditions.

In the second phase, resource prices return from their peak to a new long-term average, and growth patterns tend to diverge between countries. Growth is often supported by employment and investment increases. The additional labor usually comes from public-sector employment as the government uses some of the resource windfall to pay higher government salaries and hire more workers. It may also come from local services such as retail trade and financial services as some of the resource wealth is recycled into the local economy. Investment is supported by the resources sector, by related sectors that benefit from activity in the resources sector such as real estate and utilities, and by the government investing some of the windfall in infrastructure projects.

However, in this second phase, there are five main ways that growth can be hampered. First, as the resources boom moderates, the terms of trade decline. Second, a lack of focus on driving competitiveness in the resources sector leads to declining investment in capital. Third, private investment is often limited by macroeconomic volatility, currency appreciation that reduces the competitiveness of non-resources sectors, and concerns about the business environment, all of which government may have failed to address properly because it is preoccupied by the resources boom. Fourth, capital productivity declines further as supporting infrastructure such as utilities are ramped up quickly, as governments fail to select and execute their major capital projects effectively, and as private-sector funds flow into non-productive areas such as real estate. Finally, labor productivity can come under pressure as the share of public-sector employment rises—often adding roles that do not add value—and many of the bottlenecks that prevent improvements in private-sector productivity go unaddressed.

Finally, in the third phase after the boom, prices settle at a new average. Countries that struggled in the second phase face new pressure on government budgets. As government expenditure slows, the risk is that overall economic growth can decline significantly.

It is instructive to look at these three phases during the spike in oil prices during the 1970s. We find that resource-driven countries fell into four groups in terms of how they responded and that only about one-third of them managed to sustain robust growth after the boom ended (Exhibit 28).

The first group, which includes Canada, Indonesia, Norway, and Oman, sustained rates of GDP growth of 2 to 4 percentage points above the global average through all three phases. They supported growth in their resources sectors by improving competitiveness and adopting a range of policies to drive productivity across other sectors of the economy.

A second group of countries, including Algeria, Brazil, and Syria, benefited from a burst of high growth while oil prices rose, but then their economies lost momentum as prices returned to a new average. The three economies grew at almost 3 percentage points above the global average, but growth rates fell back to the average once prices had peaked.

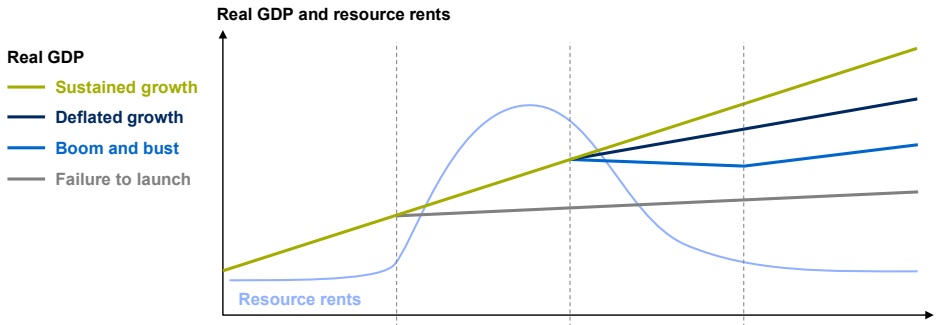
Economies in the third group, including Ecuador, Mexico, Saudi Arabia, and the United Arab Emirates, experienced a "boom and bust" cycle that matched movements in prices. These economies initially posted the most rapid growth, but after prices peaked, real GDP declined before growth returned (albeit at lower levels than before the boom). The failure to drive capital productivity in the resources sector and productivity overall in other sectors was a common characteristic in these countries.

The final group of countries, including Iran, Nigeria, Peru, and Venezuela, experienced a "failure to launch." They missed out on the benefits of the resource boom altogether and experienced below-average growth rates through all three phases due to a combination of political instability, corruption, and concerns among investors about expropriation that limited their commitments to these economies.

Exhibit 28

Few resource-driven countries have sustained economic growth after a boom

1970s oil price spike illustration



Average annual real GDP growth %	Long-term 10-year historic trend (1963–72)	Boom (Phase 1) Commodity prices rise (1973–80)	Return (Phase 2) Commodity prices fall to new long-term average (1981–85)	Post-boom (Phase 3) 10-year post-boom trend (1986–95)
Sustained growth (n = 7) Examples: Canada, Indonesia, Norway, Oman	7.0	6.3	6.2	5.1
Deflated growth (n = 4) Examples: Algeria, Brazil, Syria	6.9	7.5	2.7	2.7
Boom and bust (n = 5) Examples: Ecuador, Mexico, Saudi Arabia, UAE	7.6	8.9	-2.5	2.6
Failure to launch (n = 5) Examples: Iran, Nigeria, Peru, Venezuela	6.3	2.5	1.2	2.8
Global average	**5.6**	**4.2**	**2.4**	**2.6**

SOURCE: World Bank; McKinsey Global Institute analysis

Even when resource-driven economies sustain above-average economic growth over the long term, they do not necessarily enhance prosperity in the broader sense, as measured by MGI's economic performance scorecard.[164] As discussed in Chapter 1, resource-driven countries on average perform almost one-quarter lower than non-resource-driven countries on our scorecard.

164 The MGI economic performance scorecard measures economic progress across five dimensions: productivity, inclusiveness, resilience, agility, and connectivity. See the appendix for further details on the methodology and the specific metrics used to assess performance.

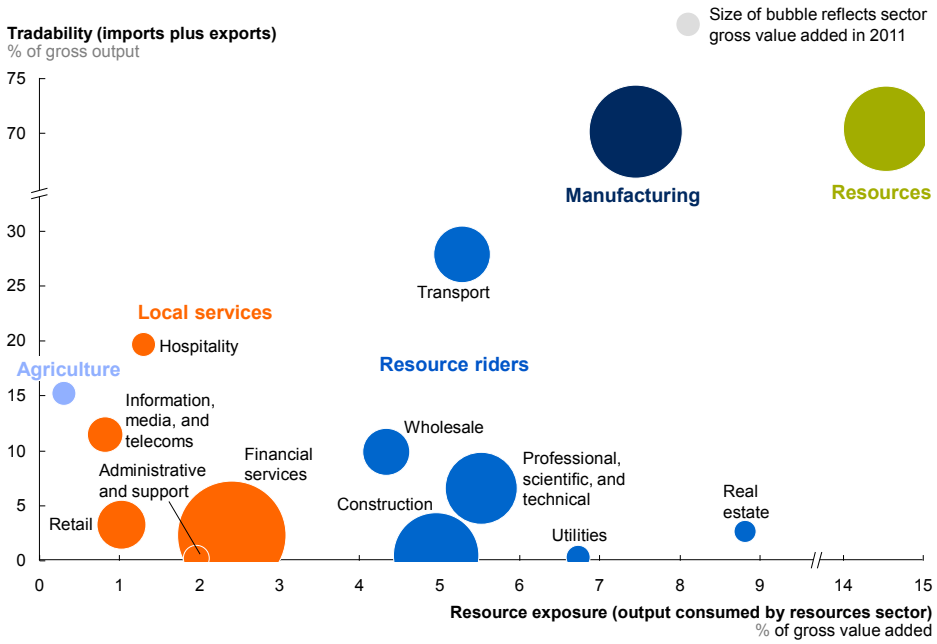
CREATING LONG-TERM PROSPERITY REQUIRES DRIVING PRODUCTIVITY ACROSS ALL SECTORS OF THE ECONOMY

As resource-driven economies focus on driving economic development, they should consider five distinct groups of sectors that operate differently from one another and require different interventions (Exhibit 29). We arrive at these five groups by looking at their exposure to the resources sector, measured as the proportion of output consumed by the sector, and their tradability defined as the sector's combined imports and exports as a share of its total gross value added. A combination of the two indicates that the sector is more sensitive to changes in exchange rates and terms of trade, as well as volatility in resource markets.

Exhibit 29

Previous MGI research finds that it is important to identify clusters of sectors based on their exposure to resources

AUSTRALIA EXAMPLE



SOURCE: *Beyond the boom: Australia's productivity imperative*, McKinsey Global Institute, 2012; McKinsey Global Institute analysis

Using this analysis, we find that the most sensitive is—obviously—the resources sector itself, including not only production but also local supply chains and opportunities to capture downstream opportunities (see Box 10, "Beneficiation: Capturing more of the value chain"). The next most sensitive is the manufacturing sector, which is often adversely affected by a resources boom due to local cost inflation, competition for skilled labor, and exchange rate appreciation that reduces international competitiveness. We call sectors that support and benefit from resource booms "resource riders"—they include transport, construction, professional and technical services, real estate, wholesale goods, and utilities. After resources and manufacturing come local services and agriculture, which are much less sensitive to changes in exchange rates and the terms of trade.

Box 10. Beneficiation: Capturing more of the value chain

"Beneficiation" originally referred to the treatment of raw materials in preparation for smelting. The term has since been adopted by economic development experts to describe a strategy that leverages an existing sector to create additional jobs and economic activity in subsequent stages of the value chain. In the resources sector, this often means creating new industries that process a country's resources rather than export raw materials. In the case of gems, this could involve cutting and polishing the stones. For metals, it could be building capacity in the refining and manufacturing processes. Importantly, beneficiation refers to adding activity downstream from the existing sector, as opposed to local content, which describes upstream or parallel parts of the value chain.

It is easy to appreciate the attractiveness of beneficiation for resource-driven countries, particularly those with lower average incomes that are keen to drive economic development through capturing value from their resources endowments, create jobs, and even secure the supply of a resource that is critical to their economic progress. However, there are potential downsides to beneficiation. If the activity is not intrinsically economically feasible, governments may be tempted to subsidize the relevant sector at great cost to the taxpayer. An approach centered on regulation through mandates on resource companies or export barriers may undermine the competitiveness of the extraction sector more than it supports the downstream activity, leading to an overall net loss in both value and employment. For example, one analysis of Botswana's policies aimed at capturing the cutting and polishing of diamonds for domestic players found that they were equivalent to a $31.17 per carat tax on processors. In 2009, this would have imposed a total annual cost of more than $15 million, or $4,800 per job, not counting the additional cost of numerous grants from government to move production.[1] Recent research has found that very few countries succeed in exporting both raw and processed materials or manage to make the transition to greater processing.[2]

So how can resource-driven countries usefully think about capturing downstream value and avoid past failures? Governments should consider the following five main lessons:

- **Understand the potential value of moving downstream.** Moving downstream can add considerable value and create jobs. The amount varies significantly among resources. For many resources, greater value often lies at the far end of downstream processing and will therefore require end-to-end capabilities. In the diamond market, for example, only $6.5 billion of value is added in the cutting and polishing stages, but $46 billion of value is added during the manufacture of jewelry and at the retail sales stage. The attractiveness of moving downstream also varies significantly among resources and over time. For example, margins in the steel industry have been reduced considerably because of overcapacity and rising energy costs.

1 Roman Grynberg, *Some like them rough: The future of diamond beneficiation in Botswana,* European Centre for Development Policy Management discussion paper number 142, March 2013.

2 Ricardo Hausmann, Bailey Klinger, and Robert Lawrence, *Examining beneficiation*, Center for International Development working paper number 162, June 2008.

Box 10. Beneficiation: Capturing more of the value chain (continued)

- **Understand the fit with local capabilities.** Too often resource-driven countries have launched beneficiation strategies without a rigorous assessment of the potential of the country to be competitive in the new area. They should consider four factors. First, for many resources, the presence of a large nearby market—either domestic or international—for the final product is important for where activity takes place. For example, in thermal coal, the more advanced stages of beneficiation will typically be located closer to final demand; blending needs to be near multiple sources of coal and a power plant. There is somewhat more scope for where to undertake the oil and gas refining process. Nevertheless, it is more expensive to transport numerous distillates than to transport crude oil, and therefore the economic logic still dictates that the refining process should take place close to final demand. Second, resource-driven countries need to consider the fit of beneficiation efforts with the local skill base and business environment. Third, scale is often important because setting up a new location for a sector, particularly one based around physical goods, often involves large fixed costs. Companies need to know that there is sufficient labor and other inputs based locally or amenable to importing to the area of activity so that they can ramp up production and reduce fixed costs per unit. The fourth aspect that countries need to understand is transport logistics. Some goods, including natural gas and bulk minerals, have relatively large transport costs, and it therefore saves money if the final product is sold close to the site of extraction.

- **Establish supporting regulations.** Given the potential value at risk from poorly designed beneficiation policies, any regulatory intervention needs to be undertaken on the basis of a strong fact base. As with local-content policy, governments need to understand the opportunity cost of regulation. Regulation is clearly justified in cases of market failures. Addressing information failures that leave local firms without a proper understanding of the viability of potentially profitable economic opportunities is one example. Governments can also play a useful role when there are coordination or network failures and an investment becomes viable only if other entities also invest to capture economies of scale.

- **Don't just regulate—build enablers.** The local environment is critical to the success of beneficiation. Identifying skill gaps and developing technical courses to fill them are necessary, as is a constant focus on improving infrastructure including reliable energy supply and transport. Many of the lessons we have described for local content are applicable to beneficiation.

- **Monitor and enforce.** It is often difficult for policy makers to monitor the implementation and impact of beneficiation policies. Government should strive to make procedures simple, create incentives to enforce compliance, coordinate different institutions so that monitoring is effective, engage closely with the relevant private-sector players, and adjust the approach as necessary to ensure that the competitiveness of the resources sector is not put at risk by policy changes.

Countries that have successfully navigated resource booms and busts have been effective in addressing productivity barriers in a tailored way sector by sector rather than through a single approach—and particularly in those sectors beyond resources, such as local services, manufacturing, and agriculture, as described below:

- **Local services.** Local services, which include hospitality, telecommunications, and financial sectors, are often seen as indirect beneficiaries of resource booms. They can achieve large improvements in productivity, resulting in significant economic growth, but they are often overlooked by policy makers. Past MGI work has highlighted how removing microeconomic barriers can significantly increase productivity and economic growth.[165] Take the example of Indonesia's financial services and retail sectors. Financial services contributes 8 percent of Indonesia's GDP but is hamstrung by regulatory complexity and overlap. The simple act of consolidating regulatory functions could ease the burden in the sector and assist in driving economic growth.

- **Manufacturing.** Manufacturing sectors face a range of challenges in resource-driven countries, including currency pressures that make them less competitive in global markets and competition for limited skilled talent in the resources and resource rider sectors. Countries have often tried to improve manufacturing competitiveness through various subsidies and procurement legislation, wasting considerable public funds in the process. It may be more effective for governments to focus on building the enablers to support productivity in these different subsegments. In labor-intensive sectors such as textiles, apparel, and leather, governments can, for example, help industry improve competitiveness by reducing burdensome labor regulations. In energy- and resource-intensive manufacturing sectors such as basic metals, refined petroleum, and wood products, resource-driven commodities can potentially benefit from their resource endowments, provided they can minimize transportation costs (by addressing infrastructure bottlenecks) and ensure cost-efficient access to energy.[166]

- **Agriculture.** Agriculture, like manufactured goods a sector that produces a tradable commodity, can be adversely affected by currency appreciation and domestic cost inflation. However, a resources boom can also be an opportunity to create a step change in agricultural productivity. A rapidly growing resources sector can create rising prosperity and therefore increase the demand for food. At the same time, a resources boom can reinforce urbanization through the migration of people from rural areas to cities by creating demand for local services and potentially public-sector employment. Higher demand for food and fewer people working on farms is an opportunity to adopt new techniques to improve agriculture productivity—indeed, doing so is a necessity. MGI research has estimated that the productivity of Indonesia's farms needed to increase by more than 60 percent to meet domestic demand, given rising demand for food and the potential loss of eight million farmers by 2030 as people migrate from rural areas to cities.[167] As in manufacturing, governments can help enable a competitive agriculture sector by supporting

165 *Investing in growth: Europe's next challenge*, McKinsey Global Institute, December 2012.

166 For further details, see *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

167 *The archipelago economy: Unleashing Indonesia's potential*, McKinsey Global Institute, September 2012.

initiatives such as adapting global technologies to local conditions, reducing waste through better post-harvest storage and cold chain systems, and shifting to high-value crops.[168]

Making it happen: The delivery challenge

To support progress in all the areas we have highlighted in this chapter will require strong governance in resource-driven countries, including new institutional mechanisms that enable a coordinated approach to the linked and overlapping challenges of managing the resources sector. Several layers of government need to be involved, creating managerial complexity. It is vital that the roles and responsibilities of different agencies and activities—particularly the authority to make decisions—are clearly defined. Some countries have tried to manage resources with "superministries," but these efforts have not proved particularly successful. Interministerial coordination bodies have been more effective. Mexico, for example, established a presidential steering group to oversee its management of the resources sector.

Discussion of the government's role in the resources sector is often limited to policy, but the carrying out of policy also needs attention. To be successful, policy makers need to focus on a relatively small number of priority areas and stick with them for a number of years. The use of "delivery labs" to develop plans for policy execution can be highly effective. Such labs typically have 20 to 30 people from a variety of agencies, brought together to tackle an issue on a full-time basis for six to eight weeks. These labs produce clear targets, identify priority initiatives, draft a detailed action plan, and get the full range of stakeholders to sign off on it. To ensure that any such plan is enacted, some countries have created "delivery units" made up of small teams of highly talented individuals with a clear leader who focuses on ensuring that there is a chain of command from policy makers to the front line of public service.[169] Malaysia's Performance Management & Delivery Unit, for example, is playing a critical role in the country's economic and government transformation programs.

168 For a more detailed overview of the opportunities in agriculture, see two previous MGI reports: *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, November 2011, and *The archipelago economy: Unleashing Indonesia's potential*, September 2012.

169 *Delivery 2.0: The new challenge for governments*, McKinsey & Company Public Sector Practice, October 2012.

□ □ □

Reversing the resource curse will require resource-driven countries to rethink their approaches to economic development. The “Asian Tiger” approach to economic development—developing a strong manufacturing sector and moving up the value chain to produce more sophisticated products over time—fails to take into account the unique circumstances of economies driven by resources. Instead, they should consider reframing their economic strategies around a new growth model, which we dub the “Resource Tiger” approach, with three key imperatives: effectively developing their resources sector; capturing value from it; and transforming that value into long-term prosperity. The agenda that we have laid out is complex and demanding but does not involve reinventing the wheel. What we propose is not new: there are plenty of examples of best practice among resource-driven economies that others can emulate. These are practical and entirely doable changes that resource-driven countries can make to fundamentally transform their long-term economic prospects. In Chapter 3, we explore the implications for extractive companies in a changing resource landscape that will offer huge opportunities but also significant challenges.

3. Shifting from an extraction to a development mindset

Extractive companies have a major role to play in meeting the challenges of the new resource era—making sure it works for them and for host countries, and reducing any tensions that might arise as they have in the past. The companies have much to gain from forging a more collaborative relationship with governments that includes meaningful efforts to be true partners in the economic development of countries in which they are operating.

Reexamining the way extractive companies do business in resource-driven countries is an urgent priority given increasing disruptions in recent years that have had a negative impact on their bottom line. Strains and disruptions are only likely to intensify. Almost half of the world's known mineral and oil and gas reserves are in countries that are not members of the OECD or OPEC, and that may have high levels of political risk, inadequate infrastructure, and governments with little experience in managing resources endowments, and where the companies' operations attract much higher scrutiny and expectations than they would elsewhere. Some companies have seized on economic development initiatives as a key mechanism for mitigating risk and maintaining positive relationships with host governments. Now others should urgently consider reframing their missions so that they do not focus exclusively on extraction but also explicitly include a strategy for economic development in collaboration with the countries in which the companies operate. By doing so, they are likely to gain an edge.[170] This chapter examines what an economic development strategy might look like and offers some practical tools to help companies navigate the new resource era.

170 Many commentators have highlighted the fact that the most profitable companies are not always the most profit-oriented but are sometimes those that focus on a broader mission. See, for example, John Kay, *Obliquity: Why our goals are best achieved indirectly*, Profile Books, 2011.

Extractive companies face major challenges and opportunities in this changing landscape

Resource-driven countries can be tough environments in which to operate, and those companies that create partnerships with governments and communities based fundamentally on shared value will potentially win significant competitive advantage. We look at both accessing and operating resources.

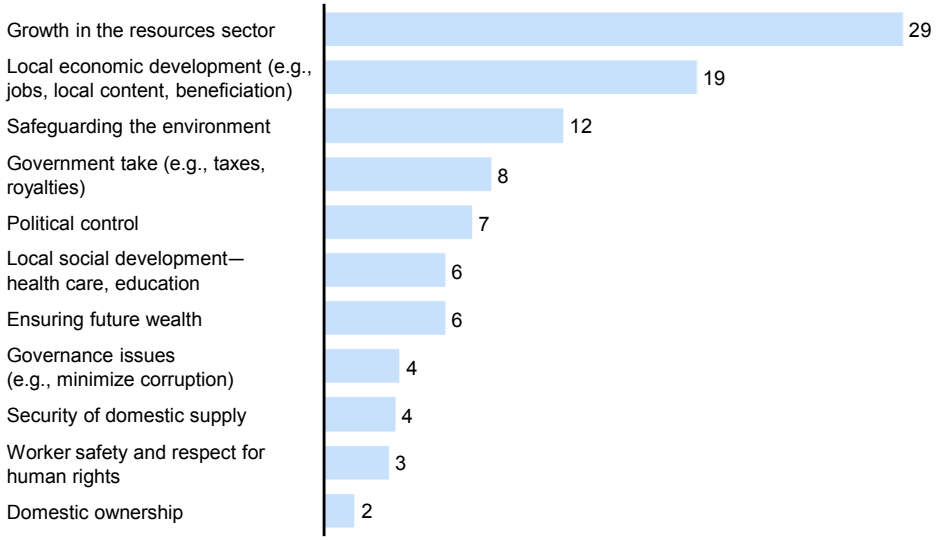
ACCESSING RESOURCES

The exploration and production of natural resources are increasingly shifting from developed countries to less developed countries. Citizens and governments in these countries often have high expectations of extractive companies, which executives need to understand and appreciate. Our analysis of a selection of speeches by policy makers in several resource-driven countries shows that there has been a strong emphasis on issues such as local economic development, and social and community benefits (Exhibit 30). The clear implication is that companies are expected to be not only responsible operators but also positive forces for job creation, economic development, and community building.

Exhibit 30

Policy makers in resource-driven countries often have a broad range of objectives for their resources sectors

% of mentions[1]



1 Based on McKinsey analysis of policy maker speeches in 16 resource-driven countries.
SOURCE: Press search; McKinsey Global Institute analysis

Moreover, competition for resources is strengthening and is coming not only from established global multinationals but also from a formidable new breed of Chinese extractive companies that are increasingly active around the world (see Box 11, “The emergence of Chinese state-owned resource companies”).

Box 11. The emergence of Chinese state-owned resource companies

Over the past 20 years, Chinese state-owned enterprises have become major players in the global resources sector. For example, China's share of global metal mine production value reached almost 15 percent by 2008, up from just 5 percent in 1989.[1] While the vast majority of their activities are domestic, many of these businesses are increasingly expanding overseas. China's presence in the resources sector is also more dispersed than is often acknowledged. While China's state oil companies Sinopec and CNPC function largely as a duopoly, in mining it is a different story. The 217 Chinese acquisitions of foreign mining firms completed by 2010 were by 75 different companies.[2] Chinese SOEs are often in competition with one another and have a measure of independence from their owner—the Chinese government.[3]

China's role in developing resources in emerging economies has been controversial. The Chinese government argues that its investment in resources sectors helps host nations to develop their economies. It says that its model of "non-interference"—demanding no political and economic reforms in exchange for its business, as many Western multinationals do—is welcomed by many African leaders as well as citizens.[4] China has undoubtedly been responsible for a wave of efficiently built public works projects that form part of "resources-for-infrastructure" deals. However, some observers argue that noninterference means working with corrupt governments against the interest of the wider public. Many have raised concerns about the environmental impact of Chinese operations, and allegations of corruption and bribery have often been raised. Perhaps the most contentious issue has been labor. More than a million Chinese nationals have moved to Africa in recent years, prompting objections that mining companies should hire local people rather than importing Chinese workers.[5] There have also been damaging allegations of poor working conditions and safety practices. An explosion in a Chinese-operated mine in Zambia in 2005, for instance, killed 46 people and provoked a long series of strikes.

However, the competitive landscape is changing quickly. In China, ongoing reforms could lead to the prospect of more domestic competition for SOEs from private-sector companies. This could put further pressure on domestic profitability and increase the importance of overseas expansion. Beyond China, there is an increasing push from many resource-driven countries to create more transparency and competition for non-monetary elements of contracts, such as the building of infrastructure projects. Among Chinese SOEs, increasing attention is being given to local development contributions to ensure better access to higher-quality assets. To date, Chinese companies have often failed to capture "tier 1" assets. If Chinese resource companies can adopt a more holistic approach to local development issues, they could fundamentally reshape the competitive landscape in the resources sector.

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1 *Overview of state ownership in the global minerals industry: Long-term trends and future*, Raw Materials Group for the World Bank, 2011

2 *Generation next: A look at future greenfield projects*, Citigroup Global Markets, June 2011.

3 Daouda Cissé and Ross Anthony, "Chinese state-owned enterprises in Africa: Entrepreneurs or the long arm of the state?" *Ivey Business Journal*, July–August 2013.

4 Steve Hess and Richard Aidoo, "Beyond the rhetoric: Noninterference in China's Africa policy," *African and Asian Studies*, volume 9, number 3, 2010.

5 Barbara Kotschwar, Theodore Moran, and Julia Muir, "Do Chinese mining companies exploit more?" *Quarterly Americas*, Fall 2011.

OPERATING RESOURCES

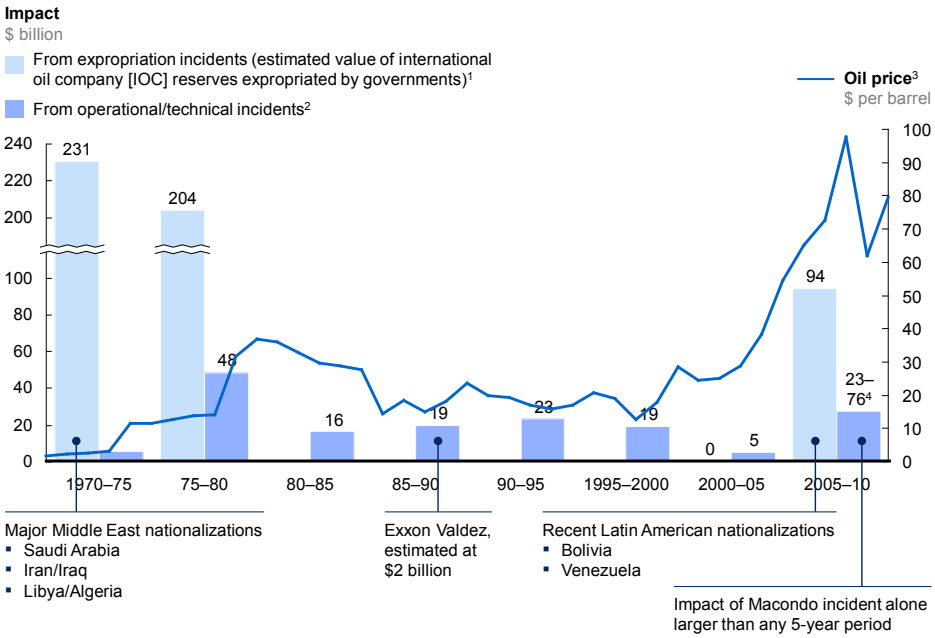
The monetary impact of risk events, particularly risks related to the license to operate, appears to have increased substantially since 2005 (Exhibit 31). Between 1990 and 1999, there were five cases of arbitration in the mining sector and five cases in the oil and gas sector, for example. But between 2000 and 2009, there were 44 cases in oil and 21 cases in mining.[171] We find that value at risk reaches a peak during the early phases of operation (see Box 12, "Value at risk across the project life cycle").

Exhibit 31

The monetary value of expropriation incidents in the oil and gas sector has increased considerably since 2005

OIL AND GAS EXAMPLE

Company impact from government- and operations-related incidents



1 Value of petroleum reserves estimated by multiplying the number of barrels of proven reserves at the time of nationalization by an assumed value per barrel of $2. From this "total value base," the value seized during nationalization is computed for each country by examining the state's ownership share of the oil industry pre- and post-nationalization.
2 Includes blowouts, upstream accidents (fires, sinkings, explosions), and downstream incidents (fires, explosions, and gas leaks, including petrochemical facilities). Does not include damage from day-to-day operational accidents such as on-the-job injuries caused during routine workplace activities.
3 Nominal annual prices.
4 Based on market consensus view on Macondo costs of $17 billion–$70 billion.
SOURCE: BP statistical review of world energy, 2011; MGI commodity database; McKinsey Global Institute analysis

171 Bernice Lee et al., *Resources futures*, Chatham House, December 2012.

Box 12. Value at risk across the project life cycle

Our review of external literature and detailed asset-level analysis reveals the following variations in the value at risk across the life cycle of a project:

- **Pre-construction.** At this stage, risks mainly revolve around access and ensuring that the right conditions are in place for all parties to move forward. Governments can block access to exploration or to feasibility studies, preventing a company from gathering the information it needs to assess and pursue investment in the country. For instance, Ontario, Canada, revised its mining exploration laws to limit access on 23,000 square kilometers of Native American tribal lands.[1] In many cases, government interventions are designed to secure an improved fiscal deal or encourage faster movement by the extractive company. Other risks at this stage, such as revised water licenses or updated labor agreements, can have a more limited impact on value. The value at stake at this stage is generally minimal, as limited capital investment has occurred in the asset.

- **Construction.** In general, the construction phase has lower risk. At this stage, initial license negotiations have already been completed, and the company adds value to the government through both infrastructure investment and job creation. This reduces the incentive for the government to disrupt operations. Risk events during this period tend to arise from protests, strikes, or attacks driven by local communities that see this as their last chance to gain concessions, or driven by forces that oppose the government and see disrupting the project development as a mechanism to make their voices heard. In 2011, Chevron's construction of a gas pipeline in Nigeria was disrupted when local Ijaw youth occupied the construction site.[2] In addition, structural factors such as government inefficiency that delays the procurement of permits or one-off events like weather-related supply shocks are also present in this phase.

- **Early operations.** The first years of operation tend to be the most risk-prone. There have been many instances of expropriations, governments changing license or tax conditions, worker disputes, and legal concerns. The reason for this heightened risk is clear—the company has already invested in the project infrastructure and is just beginning to extract materials; the value available from seizing property or changing license terms is at its highest from a government's point of view. Projects are commonly protected by a "tax holiday" during their initial years of operation and can therefore be perceived to be capitalizing on local resources while making a relatively low fiscal contribution. Companies are often simultaneously scaling back jobs created during the construction phase by a factor of ten (often from 10,000 to 15,000 during construction to less than 1,000 during operations). This combination can tempt policy makers to disrupt operations in an effort to boost their share of revenue.

- **Lease renewal or reinvestment.** An inflection point when leases must be renewed, or when companies are contemplating large-scale investments to prolong the life of the asset, brings back some of the considerations from the pre-construction phase.

- **Steady-state operations and closure.** Major risk events during steady-state operations tend to mirror those during early operations, although they occur with less frequency and are more often linked to governments' political imperatives, such as impending elections. Tax holidays have expired, the shock of reduced employment following the end of the construction phase has waned, and there is less desire among stakeholders to interfere. Tax increases, license revisions, legal and regulatory risks, safety and operational incidents, and general unrest are among the biggest risks during this period. Examples include the 2013 attacks in Nigeria that shut down Shell pipelines for a week and cost the country an estimated $1 billion in revenue.[3]

1 *Mining Act modernization*, Ministry of Northern Development and Mines, Ontario government, 2012.

2 "Ijaw youths disrupt Chevron's gas project," *Nigeria Oil and Gas Intelligence*, December 2012.

3 Theophilus Abbah, Hamisu Muhammad, and Isiaka Wakili, "Nigeria lost $1 billion to pipeline shutdown in seven days," *All Africa*, March 12, 2013.

The value at risk for the resource companies from operating in resource-driven countries has increased for the following three reasons:

- **Resource prices are high and volatile.** As we have noted, the volatility of resource prices is at an all-time high and is likely to remain high over the next 20 years. Price volatility can undermine the social contract between extractive companies and governments. If governments feel they are not obtaining their fair share of a project's revenue when prices spike, there is pressure to renegotiate contract terms. In addition, volatility can deter private-sector investment, thereby increasing government pressure on extractive companies to make better use of existing licenses. Data from Chatham House show that the incidence of arbitration corresponds strongly with the rise in oil and metal and mineral prices since 2000.[172]

- **New investments are bigger, more expensive, and riskier.** New projects are increasingly in frontier regions that are environmentally challenging, geologically complex, and logistically weak, driving up project costs. A recent report from Citigroup profiled 400 new mining projects that would require capital of more than $500 billion if all were to go ahead.[173] Not only does this represent large value at risk for companies—and an important risk of having "stranded assets"—but higher complexity can also mean greater risk of delays. The same Citigroup report found that nearly 25 percent of projects were unlikely to be developed before 2020, with a further 40 percent at risk.[174] Operational disruptions or unexpected changes to fiscal regimes can have a greater impact on projects that are more capital-intensive due to their reliance on larger operating margins to cover the significant up-front investment.

- **Projects are a large share of the economies.** Historically, petroleum projects have been on a huge scale relative to their host economies, but today some mining projects are on a similar relative scale (Exhibit 32). For example, Rio Tinto's Simandou iron ore project in Guinea is expected to produce revenue higher than 130 percent of the country's GDP in 2012, based on forecast prices and production growth.[175] Extractive companies in projects such as these have a highly visible role in the economies in which they operate, and therefore expectations are higher about, for instance, the number of jobs they create and the amount of tax revenue they generate.

172 Ibid.

173 C. Sainsbury et al., *Generation next: A look at future greenfield growth project*, Citigroup Global Markets, June 2011.

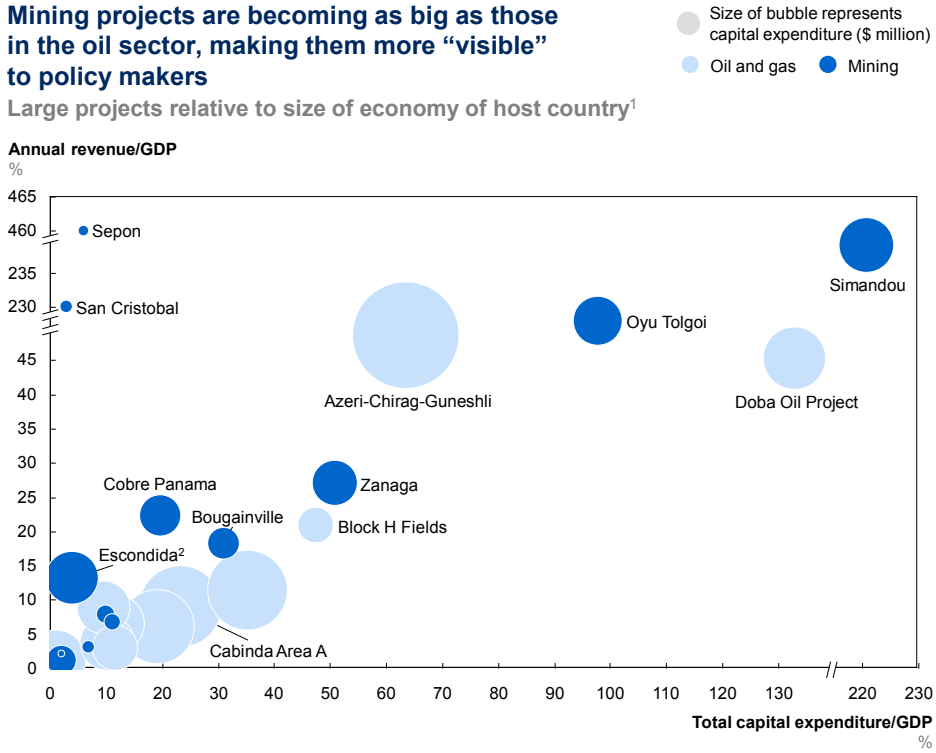
174 Ibid.

175 *Simandou: Economic impact report*, Rio Tinto, May 2013. Based on 2012 iron ore prices and the 2011 GDP (as shown in Exhibit 32), the revenue could represent a higher percentage of the country's GDP.

Exhibit 32

Mining projects are becoming as big as those in the oil sector, making them more "visible" to policy makers

Large projects relative to size of economy of host country[1]



1 Based on public data, 2011 GDP, and mining assets valued at 2012 average prices; no data available for Grasberg mine (Freeport-McMoRan).
2 Includes both Escondida Norte (opened in 2005) and Escondida Sulfide Leach project (opened in 2006).
SOURCE: World Bank; Wood Mackenzie; McKinsey Global Institute analysis

Managing the changing landscape requires companies to adopt a development mindset

Extractive companies spend hundreds of millions of dollars over decades to accurately assess and understand the geological and technical aspects of project development. They spend much less time and money on developing an equally sophisticated view of the political, societal, and economic factors that shape the countries in which they operate. This needs to change. Securing and retaining access to high-quality assets over the long term is one of the most critical aspects if extractive companies are to secure sustained value for their shareholders. For this reason, local economic development needs to be moved into the core of company strategy. We believe companies should take three important steps:

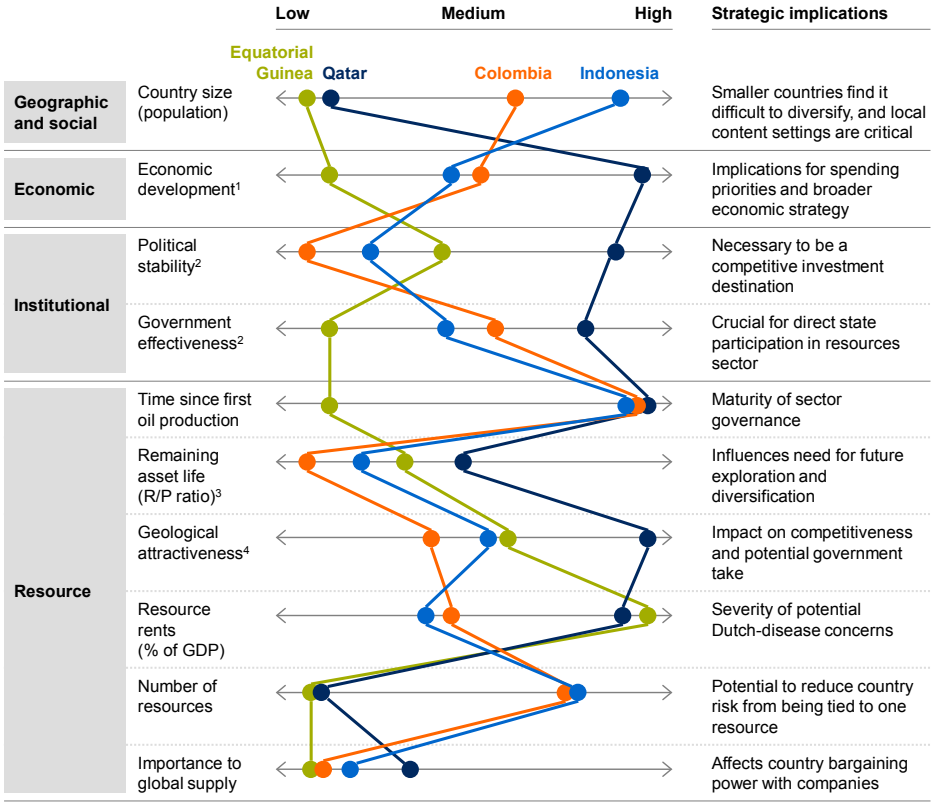
Develop a detailed understanding of the country context

Executives need to fully understand ten key dimensions of their operating environments that vary from country to country and use that understanding to tailor their approaches (Exhibit 33).

Exhibit 33

Companies need to understand ten important dimensions of resource-driven countries

OIL & GAS EXAMPLE



1 Using the McKinsey Global Institute Economic Performance Scorecard.
2 Using World Bank Worldwide Governance Indicators.
3 Reserves/production ratio from BP statistical review of world energy.
4 Based on position of country's resource assets on the supply cost curve.

SOURCE: World Bank; BP statistical review of world energy, 2013; McKinsey Global Institute analysis

One important dimension is the size of the country and therefore the relative importance of the resources sector. In countries with relatively small populations, such as Qatar and Botswana, the extractive industry may be far more important to economic development than in larger countries that are likely to have a more diversified economy and larger domestic markets. As a result, the extractive industry will likely be the subject of much closer scrutiny by governments in smaller countries.

Another important aspect is the stage of a host country's economic development. Governments of countries with less developed economies are more likely to rely on revenue from resource extraction since other sources of tax revenue may be limited. They will also probably rely on private companies to play broader roles within the economy. There are often expectations that extractive companies will provide social services to the community (see Box 13, "The community development challenge") or develop infrastructure. Companies may also face a stronger imperative to contribute to broader economic development. In countries with weak institutions and low levels of government effectiveness, companies may face increased delays and higher operating costs, and political instability may raise the risk premium required for investment.

The nature of the resource sector in a given setting is a critical factor, too. If the country has a long history of production, it will probably be easier to find local suppliers and skilled staff, and regulators may be more experienced in dealing with industry. South Africa is an example of such a country, while "first-timers" such as Mozambique and Mongolia are at the other end of the spectrum. The remaining life of an asset is also important. Are the available resources there for hundreds of years (as they are in Qatar) or merely for a decade or so? A longer time horizon encourages both governments and companies to strike long-term stable agreements.

The country's position on the global cost curve influences its competitiveness and therefore what rents it will yield and what additional costs it can impose through taxes or other regulations such as local-content requirements. The government's dependence on resources is another relevant factor. Are resource rents the biggest component of GDP, as they are in Angola and Equatorial Guinea, or do they simply supplement revenue from a diversified national economy as they do in Norway? Related to this dimension is the country's reliance on one specific resource. Is the country a mono-exporter, as Nigeria is in the case of oil and Mali in the case of gold?

Finally, extractive companies need to take into account the host country's share of global supply. If this is significant for a given commodity, it can increase a country's bargaining power—an example being Botswana in the diamond sector—but it can also generate geopolitical concerns from large resource-consuming nations, as is the case with Saudi Arabia and oil.

In countries that do not have the rule of law—those with weak political stability and limited respect for property rights, for example—and no agreed social contract for the role of the resources sector and its contribution to the country, only investors with a strong risk appetite should consider operating in them. In countries where there is a rule of law but no established paradigm for developing resources, it is important for extractive companies to work with the government to create the social contract. Change on any of the dimensions we have discussed could fundamentally alter the company-government relationship. In Mozambique, for instance, before recent natural gas finds were announced, companies operating in the coal mining sector had broad access to government decision makers. Afterward, however, they found that their access was more limited, and this hampered their efforts to drive their projects.

Box 13. The community development challenge

It is becoming increasingly important for extractive companies to engage with communities in order to help maintain their social license to operate, avoid conflict and stoppages, and manage their international reputation and the interests of their many stakeholders.

The extractive industry can have an impact on local communities in three major ways: employment, the environment, and society. All are changing. There are fewer job opportunities in the production of resources because of increased specialization and automation. Communities are increasingly concerned about pollution, long-term environmental degradation, and damage to areas of cultural value. And there are concerns in communities about the unequal distribution of economic benefits, conflict over the preservation of certain sites, traditional ways of life, the resettlement of indigenous populations to make way for mining projects, and the introduction of migrant or temporary, fly-in-fly-out workers who do not tend to invest their incomes locally. Given that most of these workers are single men, there are also concerns about the potential for their disruptive behavior in local communities.

There are a number of ways to address these concerns at each stage of the project cycle:

- **Access.** Before mining begins and while extractive companies are negotiating the terms of operations with governments, they can specify contributions to education and infrastructure in the local community, often through "free prior and informed consent." In the past, many such agreements were struck later in the mining process as a response to conflict with local communities, but they should be negotiated before mining begins.[1] Canada uses an "impact benefit agreement" with indigenous communities.[2] This approach establishes rights and articulates the terms of operational benefits.[3] One example, the Diavik Diamond Mine participation agreement with five indigenous groups, provided not only for the groups' participation in the economic benefit of the mine but also for their compensation.[4] For instance, the agreement stipulated that indigenous employees would be employed in 40 percent of long-haul trucking journeys.[5]

1 W. J. Couch, "Strategic resolution of policy, environmental and socio-economic impacts in Canadian Arctic diamond mining: BHP's NWT diamond project," *Impact Assessment and Project Appraisal*, volume 20, number 4, 2002.

2 I. Sosa and K. Keenan, *Impact benefit agreements between aboriginal communities and mining companies: Their use in Canada*, Canadian Environmental Law Association, October 2001.

3 Carole Blackburn, "Searching for guarantees in the midst of uncertainty: Negotiating aboriginal rights and title in British Columbia," *American Anthropologist*, volume 170, number 4, 2005.

4 S. Nish and S. Bice, "Community-based agreement making with land-connected peoples," in *New directions in social impact assessment: Conceptual and methodological advances*, F. Vanclay and A. M. Esteves, eds., Edward Elgar Publishing, 2011.

5 Ibid.

Box 13. The community development challenge (continued)

- **Ongoing operations.** Engagement with the local community while mining is under way focuses on ways to transfer the value of production to local communities. Typical approaches are "inclusive-business" and "local-content" rules that include local businesses and individuals in the procurement and services of the extractive operations. In Chile, for example, an inclusive business program run by the Fundación Minera Escondida works to expand the production of local indigenous food, skills, and handicrafts by providing investment and training support to communities and creating a market for these goods by negotiating contracts for the mine to purchase them.[1] Another approach is contributing to microfinance programs and training to help establish capacity and investment for small businesses. Anglo American runs such a program in Chile, modeled on the company's Zimele scheme in South Africa. Another approach is creating new job opportunities for the local community.[2] Some of these jobs can be specified before production, as under the Diavik Diamond Mine's participation agreement; others can occur later by prioritizing contracts with local companies and reducing barriers to those businesses to engage in the tendering process.[3]

- **Sustainability.** Other forms of engagement occur when mining is under way and are designed to continue after the mine eventually closes. They often focus on building local human capacity. Corporate foundations, trusts, and funds are increasingly popular models for capturing the economic benefit of extractive projects and making direct redistribution of these benefits through community-led governance of the funds. Today, more than 60 such funds are operating in developing countries.[4] Most are associated with the largest extractive companies. Some provide only funding while others are actively involved in the implementation of education and development programs. One example of a fund in operation is the Rössing Foundation in Namibia and its national education program in math, science, and English. The program has even influenced the national curriculum, which Namibia is recasting so that it provides young people with the skills they will need to find jobs in the many emerging industries across the country.[5] The considerable sums of money dedicated to these funds indicate they will have an increasingly significant role into the future. For example, the Freeport Partnership Fund for Community Development in Indonesia has total contributions of more than $242 million.[6]

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1 www.fme.cl/proyectos/programa-negocios-inclusivos.html.

2 A. M. Esteves and M. A. Barclay, "Enhancing the benefits of local content: Integrating social and economic impact assessment into procurement strategies," *Impact Assessment and Project Appraisal*, volume 29, issue 3, 2011.

3 Ibid.

4 E. Wall and R. Pelon, *Mining foundations, trusts and funds: A sourcebook*, World Bank, June 2010.

5 Rössing Foundation education programs, http://rossingfoundation.com/education_programme.htm.

6 E. Wall and R. Pelon, *Mining foundations, trusts and funds: A sourcebook*, World Bank, June 2010.

Rigorously assess the company's current contributions and how they match expectations

Having developed a sense of the countries in which they are operating, companies need to improve their understanding of the impact of their operations on host countries and how they could more effectively meet the host countries' expectations.

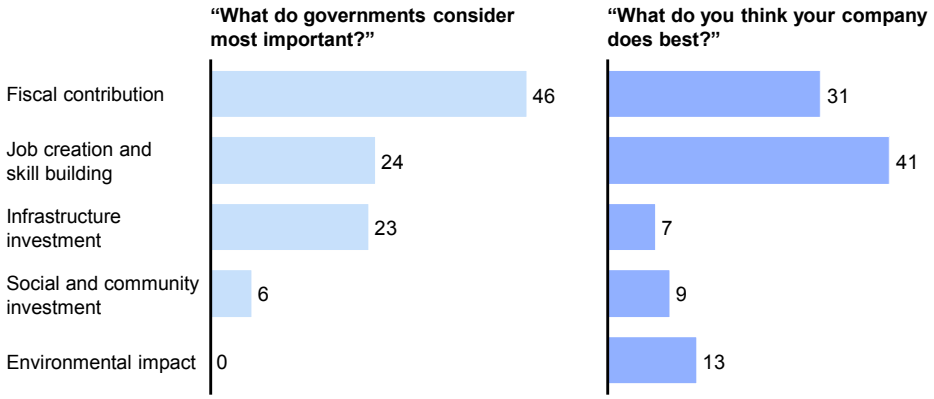
Most extractive companies make substantial contributions to the countries in which they operate. They can make a fiscal contribution by meeting national tax, royalty, and equity obligations in a transparent and non-corrupt manner. Companies contribute to job creation and skills building through the development of their own workforces and supply chains as well as through resource beneficiation and industrial development. They invest in infrastructure, creating broader societal benefits. Their activities can benefit local communities through contributions in the areas of health, education, safety, site rehabilitation, and economic sustainability. And, finally, they can play an important role in minimizing air, land, and water pollution and in reducing waste and preserving biodiversity.

Most companies make some effort in all these areas. However, a survey we conducted among 22 industry leaders from some of the world's largest mining companies highlighted an interesting mismatch. When asked how they thought government stakeholders would rank the importance of different levers for social and economic development, infrastructure investment was seen as one of the most important areas. However infrastructure was also regarded by these executives as one of their worst-performing areas. In contrast, environmental impact was considered an area where their companies performed relatively well, but was viewed by the mining executives as a very low priority for governments (Exhibit 34).

Exhibit 34

Mining executives believe that government's priorities often differ significantly from those of their companies

% of answers (n = 22)



SOURCE: Survey of 22 mining executives, July 2013; McKinsey Global Institute analysis

Our analysis at the asset level confirms that the efforts that companies make to help further the economic development of the countries in which they are operating often fail to match the priorities and expectations of host governments and citizens. In one instance, the company was performing strongly in all

areas of environmental management, but far less well on infrastructure and job creation—yet the latter two were the core concerns of the local government. Such misalignment is clearly a risk not only because companies may be failing to meet expectations in critical areas and thereby undermining relationships, but also because they may be investing in areas that are not going to be effective in their bid to strengthen their relationships.

Of course, the various players in the resources sector have different interests and priorities, and extractive companies need to strike a careful balance between them. Those players are not only governments—companies also need to understand and engage with global media, local communities, and lobby groups, all of which tend to have strong opinions about "what matters" in the company's country of operations.

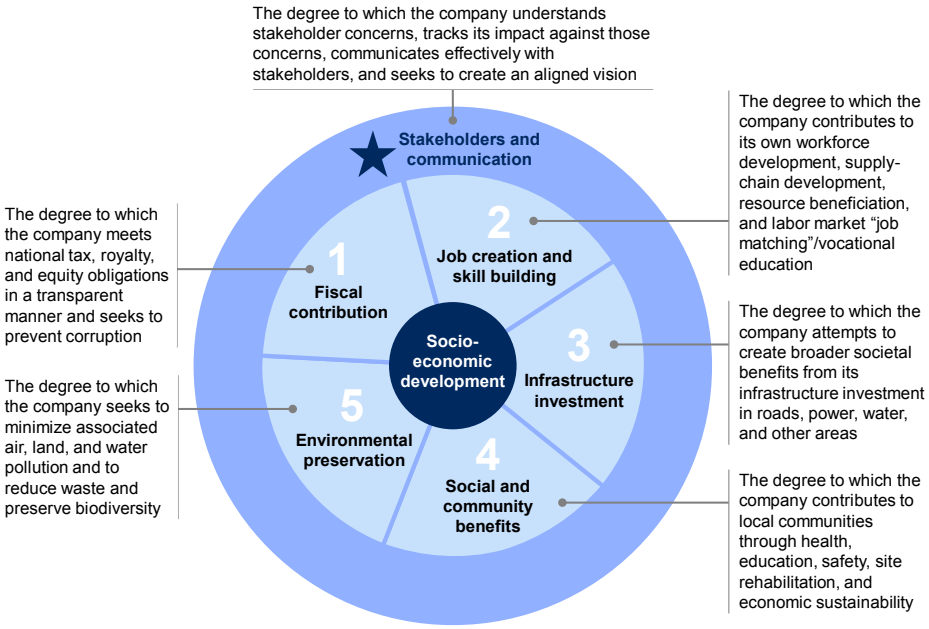
We believe companies need to improve evaluation of their own performance, compare themselves to best practice on all the dimensions we have discussed, and examine whether their efforts match expectations. This is the only way to judge whether current efforts really offer value and whether companies should alter their current emphasis.

A number of tools exist today to help companies make such assessments. These include the Global Reporting Initiative, the Dow Jones Sustainability Index, and FTSE4Good. However, they have a number of drawbacks. For instance, they typically review group-wide performance rather than performance at the asset or country level, and therefore fail to capture local realities. Many existing tools also give equal weighting to all aspects of performance on sustainable development and do not take account of the fact that local stakeholders may prioritize issues very differently than companies themselves. Finally, all too frequently, current tools do not link performance on sustainable development measures back to business value, leading many companies to engage in sustainable development activities that, from the perspective of shareholders, destroy value. This explains a complaint often heard from extractive companies that sustainable development is simply "the department for spending money."

We have therefore developed a tool that we believe overcomes these shortcomings (Exhibit 35). It assesses the potential of economic development activities at the asset and project level. Drawing on a broad-based review of the available literature and interviews with a large number of experts, we have developed a set of more than 90 measures across five dimensions: (1) fiscal contribution; (2) job creation and skill building; (3) infrastructure investments; (4) social and community benefits; and (5) environmental preservation. We complement this with a set of measures of the company's performance on managing stakeholders and communications efforts on the ground, which is important if the company's contributions are to have the desired impact. We have designed the tool to clarify a company's contribution to economic development by evaluating how well the company's own priorities match against those of stakeholders; comparing performance against industry best practice and stakeholder expectations; and identifying areas for capturing additional business value, either through strengthening performance in specific areas or reallocating spending.

Exhibit 35

We identify five core elements of a company's local development contributions, and one critical enabler


The degree to which the company understands stakeholder concerns, tracks its impact against those concerns, communicates effectively with stakeholders, and seeks to create an aligned vision
Stakeholders and communication
The degree to which the company meets national tax, royalty, and equity obligations in a transparent manner and seeks to prevent corruption
1
Fiscal contribution
2
Job creation and skill building
The degree to which the company contributes to its own workforce development, supply-chain development, resource beneficiation, and labor market "job matching"/vocational education
Socio-economic development
3
Infrastructure investment
The degree to which the company attempts to create broader societal benefits from its infrastructure investment in roads, power, water, and other areas
The degree to which the company seeks to minimize associated air, land, and water pollution and to reduce waste and preserve biodiversity
5
Environmental preservation
4
Social and community benefits
The degree to which the company contributes to local communities through health, education, safety, site rehabilitation, and economic sustainability

SOURCE: McKinsey Economic Development Assessment Tool; McKinsey Global Institute analysis

Based on the initial pilots of this tool with extractive companies, the following lessons emerge:

- **Extractive company priorities often do not match those of local stakeholders.** The findings in our poll of industry leaders in the mining industry were reflected at the local level. An extractive company's priorities for development are often set globally and are somewhat disconnected from those of local stakeholders. This dynamic is particularly instructive given that one of the main goals of development-focused activities is to ensure positive relations with a host government. Specific priorities varied according to the country or region, but local job creation was an issue that consistently appeared to be valued less by extractive companies than by local stakeholders.

- **Both priorities and performance can vary significantly within the same company.** We found considerable variation among companies on their priorities for economic development and how different business units of the same company performed. This variation did not appear to reflect different priorities among local stakeholders in different countries, but rather a lack of internal consistency and alignment.

- **Company performance is not adequately valued by local stakeholders.** Many efforts by extractive companies to make a positive contribution to local economic development go unappreciated by local stakeholders, and as a result companies are seen to be making less of a positive contribution than they actually are. This is sometimes due to the mismatch of priorities mentioned earlier and sometimes due to a failure on the part of companies to communicate their efforts effectively, leading to a lack of understanding and support both within government and in local communities.

As we have mentioned, effective corporate performance on economic development and sustainability is not simply spending more money. No matter how attractive a deposit or an oil field may be, the rents can never be sufficient to meet all of the potential demands of the host country in terms of infrastructure, health care, schooling, and other social needs.

It is therefore vital to assess the business case for each of these areas with hard economic analysis that will determine what benefits might come from any additional investment. Our pilots of the performance-tracking tool with several companies suggest that companies often fail to make such calculations and that there might be significant potential value in linking investment to areas that will yield direct benefits, perhaps in the form of lower supply-chain costs, increased labor productivity, reduced project risks, or accelerated permitting.

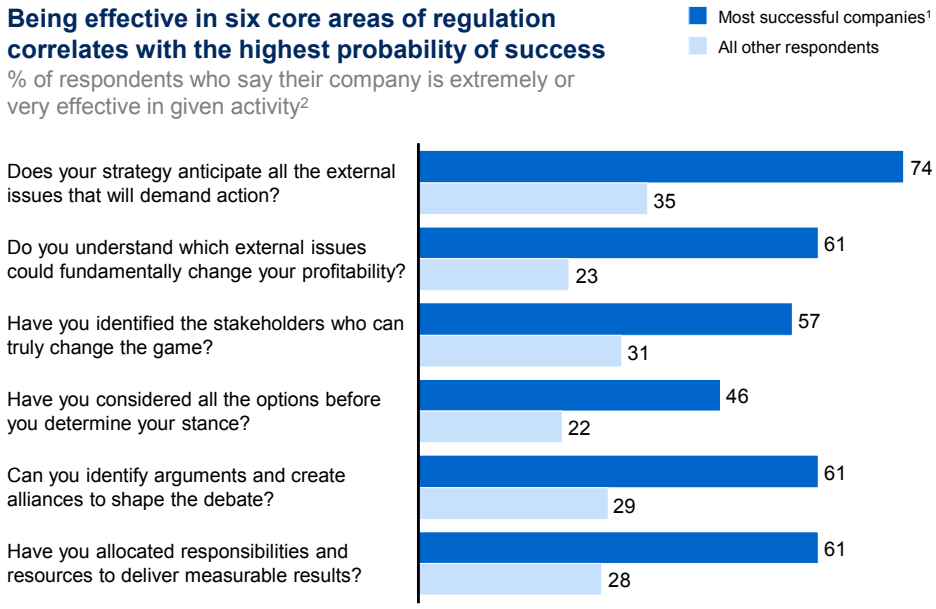
Impact is not necessarily connected to cost, either. One company found that it could significantly improve local community relations and reduce the threat of operational disruptions by adopting measures as simple as enforcing mandatory speed limits for its trucks as they went through the local villages.

Finally, investment in good regulatory and stakeholder management is crucial in order for companies to reap the benefits of their investment. This is consistent with research conducted by McKinsey's Regulatory Strategy Practice, which identified six core practices for excellence in regulatory strategy. A survey of more than 3,500 practitioners in this area found that companies that are more successful in communicating externally and influencing regulators had consistently followed these six practices (Exhibit 36).

Exhibit 36

Being effective in six core areas of regulation correlates with the highest probability of success

% of respondents who say their company is extremely or very effective in given activity[2]


Most successful companies[1]
All other respondents
Does your strategy anticipate all the external issues that will demand action?
74
35
Do you understand which external issues could fundamentally change your profitability?
61
23
Have you identified the stakeholders who can truly change the game?
57
31
Have you considered all the options before you determine your stance?
46
22
Can you identify arguments and create alliances to shape the debate?
61
29
Have you allocated responsibilities and resources to deliver measurable results?
61
28

1 Respondents who said their companies were frequently successful at influencing government policy and regulatory decisions and very effective at managing corporate reputation.
2 Averages of 3,525 respondents for 16 external affairs management capabilities classified according to these six questions.

SOURCE: McKinsey regulatory service line survey, January 2012; McKinsey Global Institute analysis

Explore bold strategic moves that can help create symbiotic relationships with governments

A vital final step for extractive companies is to translate their initiatives into productive relationships with host governments that will endure for the lifetime of a project, which can often stretch for decades. This need is particularly strong in the case of extraction projects being subject to the "obsolescing bargain," in which most of the costs constitute up-front, immobile investments recouped over the life of a project, providing an incentive to governments or business partners to change the conditions of the contract after the investment has been realized. The ways in which companies can work will depend on the context, but our work with extractive clients has suggested the following core guiding principles:

- **Don't optimize for the short term.** Many extractive companies drive hard bargains to obtain the best contract with governments, ignoring the fact that, over the lifetime of a 30-year project, there will always be areas in which contractual obligations will not be met, and the outcome will depend on whether trust and good faith has been built on both sides. It is crucial that the initial deal is seen as fair and that potential future government concerns are addressed. "Tax holidays" are one obvious area that can lead to heightened tensions when local stakeholders see a very profitable project in operation yet little sign of government revenue.

- **Understand the network of decision makers and their objectives.** The network of decision makers and influencers in many resource-driven countries can be complex, and their objectives can vary. It is therefore important to understand them and develop appropriate, tailored communication approaches that speak to their specific concerns. One extractive company did this effectively by developing a detailed map of the stakeholder landscape in an African country and tailoring its communication strategy to align with it.

- **Make clear to the government what is at stake.** Many policy makers have a limited understanding of the true contributions of the resources sector to the economy. For example, in South Africa, few government stakeholders were aware that almost 90 percent of resources revenue stayed in the country. Ensuring that policy makers have the proper fact base of current contributions and how this compares to the situation in other countries is crucial to convince them that they are getting a "fair deal." It is equally important to make host governments aware of the potential downside of attempts to renegotiate deals or expropriate assets. One extractive company operating in an African country did this effectively by sharing a series of case studies with the host government, illustrating the impact on other resource-rich economies when their governments attempted to nationalize private company assets.

- **Link the company's operations to the country's vision.** Companies need to internalize the country's vision and reflect it in their operations. This requires creating a coherent message on their mission in the country and ensuring that all activities are aligned with this narrative rather than being a collection of "nice-to-do" activities. It also means that the company is consistent and is not communicating one message to shareholders and another to host governments. In some cases, this can be supported by having host government representatives on the company's board, as is the case for De Beers.

- **Make yourself indispensable.** Host governments must realize that they need the extractive company as much as the company needs them. There are different ways of achieving this partnership. In many cases the extractive company has a technological edge that the country cannot otherwise access. Other companies cement relationships by developing and operating core infrastructure, as Comilog has done with its operation of the national railway in Gabon. In other situations, we have seen companies become global advocates for the host country on key issues of concern for the country.

- **Be willing to play tough.** In the case of host governments reneging on an agreement or changing its provisions, extractive companies need to be able to demonstrate a willingness to play tough, using all available legal remedies. If done appropriately, doing so can serve as an important precedent for future disputes. For example, after ExxonMobil's assets in Venezuela were seized by the Chavez government, the company was able to recoup roughly $300 million in 2007 by targeting the international funds of the Venezuelan government held in "cash waterfall" funds.[176]

□ □ □

As the developing world captures an ever-larger share of exploration and production, it is increasingly important for companies to take a more quantitative and fact-based approach to the role they play in host countries' economic development. The new tools we have developed, which we have described only briefly in this report, are an important first step toward gaining these insights and creating more productive and mutually beneficial partnerships. At the core of this approach should be a detailed understanding of the priorities of local stakeholders, the performance of companies themselves, and the business case for change.

176 Steve Coll, *Private empire: ExxonMobil and American power*, Penguin Press, 2012.

Appendix: Methodology

This appendix outlines key points on the methodology in the following sections:

1. Defining resource-driven countries
2. Measuring economic development: The MGI scorecard for economic performance
3. Sizing of 2030 investment potential
4. Sizing of 2030 poverty impact
5. The Resource Value Chain Country Index
6. The Resource Competitiveness Index
7. Estimating infrastructure requirements in resource-driven countries
8. Economic Development Assessment Tool

1. Defining resource-driven countries

We define resource-driven countries as those economies where the oil and gas, and mineral sectors play a dominant role. We exclude agriculture from our definition of resources, as the economic and development challenges facing countries with large mineral and oil and gas resources are quite distinct from those facing agriculture-based economies.

It is important to note that not all resource-rich countries are resource-driven. China and the United States, for example, are large and important resource producers, but their overall economic performance is not dependent on resources sectors to the same extent as the countries analyzed in this report.

Countries that met any of the following three criteria were included in our research. In addition, we also included countries where there is no significant resource production today, but where the economy is likely to become resource-driven (according to the three criteria below) in the future.

- Their resource exports accounted for more than 20 percent of total exports in 2011.
- Resources accounted for more than 20 percent of government revenue on average from 2006 to 2010.
- Resource rents were more than 10 percent of GDP in 2010 (or the most recent year for which data are available).

To identify countries where resource exports account for more than 20 percent of total exports, we used trade data provided by UNCTAD. This threshold is similar to that used by others, including the IMF, to identify resource-driven countries.[177] We used Standard International Trade Classifications (SITC) to isolate the trade of non-renewable resources. SITCs 27, 28, 68, 321, 322, 325, 333, 334, 335, 342, 343, 344, 355, 667, and 971 were included in our analysis. This is similar to the definitions used by the Oxford Policy Management group, although our research excluded the trade of electric current from our definition of resources.[178] Eighty-three countries met this resource export criterion. Of these, we excluded five countries that are primarily resource "re-exporters," or countries that import and then export resources without any value-adding activities.

177 The IMF used average data from 2006 to 2010 to identify countries where at least 20 percent of total exports were natural resources. See *Macroeconomic policy frameworks for resource-rich developing countries*, IMF, August 2012.

178 OPM used slightly different criteria, identifying resource-dependent countries as those where resources account for more than 25 percent of merchandise exports. See Dan Haglund, *Blessing or curse? The rise of mineral dependence among low- and middle-income countries*, Oxford Policy Management, December 2011.

We used World Bank data on oil, gas, and mineral rents as a share of GDP to measure the contribution of resources to overall economic output.[179] Resource rents are the surplus profits generated (revenue above economic costs) through the extraction of resources. Given the lack of comprehensive data on economic value add by sector, resource rents serve as a reasonable proxy measure of the importance of resources to overall economic output. Forty-four countries (42 of which had already been identified by analyzing resource exports) were identified as resource-driven using this criterion).

Given the lack of a comprehensive data set on fiscal revenue, we identified countries where resources account for more than 20 percent of government revenue using IMF staff estimates.[180] Forty-two countries met this criterion, all of which met either the GDP or the export criteria as well, with the sole exception of Malaysia.

Identifying countries that are likely to be resource-driven in the future is, of course, highly uncertain, depending on the realization of proposed projects and on movements in future resource demand and prices. We used prospective natural resource exporters identified by the IMF as the basis for identifying future resource-driven countries.[181] Six future resource-driven countries were identified based on IMF estimates.[182]

The 87 countries that met our criteria for being "resource-driven" are shown in Exhibit A1.

179 *The changing wealth of nations: Measuring sustainable development in the new millennium*, World Bank, 2011.

180 *Macroeconomic policy frameworks for resource-rich developing countries*, IMF, August 2012.

181 Ibid.

182 Afghanistan, Guatemala, Madagascar, São Tomé and Principe, Togo, and Uganda.

Exhibit A1
Resource-driven countries

Country	Criterion: Export	Fiscal share	Resource rents	Future producer
Afghanistan				●
Algeria	●	●	●	
Angola	●	●	●	
Armenia	●			
Australia	●		●	
Azerbaijan	●	●	●	
Bahrain	●	●		
Belarus	●			
Bolivia	●	●	●	
Bosnia and Herzegovina	●			
Botswana	●	●		
Brazil	●			
Brunei Darussalam	●	●	●	
Bulgaria	●			
Burkina Faso	●			
Cameroon	●	●		
Canada	●			
Central African Republic	●			
Chad	●	●	●	
Chile	●	●	●	
Colombia	●		●	
Congo, Democratic Republic	●	●	●	
Congo, Republic	●	●	●	
Côte d'Ivoire	●			
Ecuador	●	●	●	
Egypt	●		●	
Equatorial Guinea	●	●	●	
Eritrea	●			
Gabon	●	●	●	
Ghana	●		●	
Guatemala				●
Guinea	●	●	●	
Guyana	●	●	●	
Iceland	●			
India	●			
Indonesia	●	●		
Iran	●	●		
Iraq	●	●	●	
Israel	●			
Jamaica	●			
Kazakhstan	●	●	●	
Korea, Democratic Republic	●			
Kuwait	●		●	
Kyrgyz Republic			●	
Lao PDR	●		●	
Libya	●	●		
Lithuania	●			
Madagascar				●
Malaysia		●		
Mali	●		●	
Mauritania	●	●	●	
Mexico	●	●		
Mongolia	●	●	●	
Mozambique	●			
Myanmar	●			
Namibia	●			
New Caledonia	●			
Niger	●			
Nigeria	●	●	●	
Northern Mariana Islands	●			
Norway	●	●	●	
Oman	●	●	●	
Papua New Guinea	●	●	●	
Peru	●		●	
Qatar	●	●		
Russian Federation	●	●	●	
São Tomé and Príncipe				●
Saudi Arabia	●	●	●	
Senegal	●			
Sierra Leone	●			
South Africa	●			
Sudan	●	●	●	
Suriname	●	●		
Syrian Arab Republic	●	●		
Tajikistan	●			
Tanzania	●			
Togo				●
Trinidad and Tobago	●	●	●	
Turkmenistan	●	●	●	
Uganda				●
United Arab Emirates	●	●	●	
Uzbekistan	●		●	
Venezuela	●	●	●	
Vietnam		●	●	
Yemen	●	●	●	
Zambia	●		●	
Zimbabwe	●			

SOURCE: McKinsey Global Institute analysis

2. Measuring economic development: The MGI scorecard for economic performance

To understand the economic strengths and weaknesses of resource-driven countries, we used the MGI scorecard for economic performance. It is important to stress that this tool is not designed to assess broader social or civic performance (although these concepts and implications are closely related). The scorecard draws on insights from MGI's past work on economic development to assess five dimensions found to be important in countries around the world:

- **Productivity.** Are inputs (for example, capital, labor, natural resources) used efficiently?
- **Inclusiveness.** Is economic growth shared broadly across regions, social groups, genders, and age groups?
- **Resilience.** To what extent can the economy mitigate future risks to growth (for example, demographic changes, debt, reliance on too few sectors)?
- **Agility.** Can the economy innovate and find new growth engines (whether through human capital, private-sector efficiency, or utilization of information and physical infrastructure)?
- **Connectivity.** Can the economy take full advantage of opportunities abroad through the cross-border transfer of goods, services, and skills?

Twenty-one metrics were selected to measure performance along each of these five dimensions (Exhibit A2). Four criteria were used to guide the selection of metrics:

- **Outcome-focused.** We picked metrics that measure outcomes rather than inputs or enablers. For example, while there is no doubt that institutions play an important enabling role in generating and sustaining economic performance, institutional quality is not a measure of economic performance in and of itself.
- **Robust.** Selected metrics needed to be robust, leading to a preference for hard data over perception-based indexes. Metrics that were skewed by "noise" (factors other than those intended to be isolated and measured) were also excluded.
- **Unique insight.** Metrics were selected only if they were not strongly correlated to other metrics already included in the scorecard.
- **Available.** Metrics needed sufficient data coverage across our set of 87 resource-driven countries.

Some of these metrics were actually composed of a number of submetrics, such as the various measures for ease of starting a business. The performance of countries on each of the 21 selected metrics was aggregated into a single index, normalizing results compared with the best and worst performer for each data proxy. For any given metric, a score of 1 indicates best performance and zero indicates the worst performance.

For example, the highest labor participation rate among our sample (including both resource-driven and non-resource-driven countries) is 90.6 percent, in Tanzania (which receives a metric score of 1), and the lowest is 42.5 percent, in the Palestinian Territories (which receives a metric score of zero). To calculate each country's performance on labor force participation, they were compared with Tanzania and the Palestinian Territories. Australia, with a labor-participation rate of 76.6 percent, received a score of (76.6-42.5) / (90.6-42.5) = 0.71. For those metrics with outliers further than three standard deviations from the mean, a slight difference in methodology was used, and the index value of 0 or 1 was instead set at this three standard deviations limit, depending on the direction of the outlier. Countries beyond this limit were given 0 or 1 as appropriate.

We then took a simple average of the 21 metric indices within each dimension (productivity, inclusiveness, resilience, agility, and connectivity) to arrive at an index score. Where country data for a particular metric was missing, that metric was excluded from calculating the country's score. Data had to be available for at least half of the metrics in each dimension for countries to be assessed. Each dimension was then normalized once again, in the same manner as previously discussed. Scorecard results for six countries were not presented due to lack of data. To arrive at an overall index score, we took a simple average of the five dimension scores.

Exhibit A2

MGI Economic Performance Scorecard—data proxies

	Metrics used	Time frame	Data source
Productivity	Real per capita GDP	2011	IHS Global Insight
Inclusiveness	Life expectancy	Most recent, 2000–11	World Bank Development Indicators
	Quintile income ratio	Most recent, 2002–11	UN Human Development Report
	Labor force participation	2011	World Bank Development Indicators
	Control of corruption	2011	World Bank Worldwide Governance Indicators
Resilience	Manufacturing and services GDP share	Most recent, 2002–11	World Bank Development Indicators
	Total debt service (% of GNI)	Most recent, 2002–11	World Bank Development Indicators
	Working-age population (aged 15–64)	2011	World Bank Development Indicators
	GDP volatility	Standard deviation of 2002–11 GDP growth rate	World Bank Development Indicators
	Inflation	Average consumer price inflation, 2007–11	World Bank Development Indicators
	Environmental performance index	2012	World Bank Development Indicators
Agility	Starting a new business: procedures, time, cost, and minimum capital	2013	Yale Environmental Performance index
	Expected years of schooling	2010	World Bank and IFC Doing Business rankings
	Expenditure on R&D	Most recent, 2002–11	UNESCO Institute for Statistics
	Internet users per 100 people	Most recent, 2002–11	UNESCO Institute for Statistics/ World Bank Development Indicators
	Mobile subscriptions per 100 people	Most recent, 2002–11	World Bank Development Indicators
	Infrastructure quality index	2012–13	World Bank Development Indicators
Connectivity	Trading across borders: time, cost, and documents to export and import goods	2013	World Economic Forum Competitiveness Index
	Trade-weighted tariffs (%)	2012–13	World Bank and IFC Doing Business rankings
	FDI and technology transfer index	2012–13	World Economic Forum Competitiveness Index
	International migrant stock	2010	World Economic Forum Competitiveness Index

SOURCE: McKinsey Global Institute analysis

3. Sizing of 2030 investment potential

We assess capital costs only at the extraction stage (for example, excluding downstream refining of oil or processing of metals), distinguishing them in two categories: "growth" and "replacement" capital expenditures. The former are the investments needed to bring online new supply (that is, greenfield investment with respect to current levels). The latter are investments focused on existing sources of supply, needed for maintenance and to offset depletion (that is, brownfield investments).

OIL AND GAS

The energy capital estimates come from a variety of sources including IHS Global Insight (for historical capital expenditure), the McKinsey Global Energy Perspective database (for forecasts of oil and gas demand), and Wood Mackenzie (for assessing the oil and gas extraction supply and capital expenditure associated with this demand).

To estimate the required investment in oil and gas, we considered two scenarios:[183]

Supply expansion

In this scenario, there is investment in oil and gas so that supply increases sufficiently to meet projected demand to 2030, after allowing for expected "business-as-usual" improvements in resource productivity, such as increases in the fuel efficiency of new passenger vehicles (which lower future demand somewhat). We allowed for supply-chain bottlenecks which can increase capital spend, using historical evidence from McKinsey research on oil-field services equipment costs, as well as IHS Herold data on capital costs from the financial reports of international oil companies. These data show that, in periods of high demand growth, and particularly in cases where there are challenges on supply capacity, capital equipment costs can increase by 15 percent annually. Two three-year bubbles could lead to a 10 to 15 percent increase in average annual oil and gas capital expenditure between 2010 and 2030.

Climate response

Capital investment is lower due to a combination of the capture of productivity opportunities reducing required demand (more than in the supply expansion scenario) and assumed changes in the primary energy mix away from oil and gas toward more renewables, in order to reach a 450-ppm pathway.

The 2011 IEA estimates for oil and gas extraction in its "450-ppm scenario" are more than 30 percent higher than our estimates for the climate response case, despite a 2030 level of primary demand for oil and gas that is only 5 to 10 percent greater than our projections. Meanwhile, our supply expansion capital investment estimates are closely aligned with the IEA's 2012 World Energy Outlook estimates for its "new policies" reference case. The divergence in capital expenditure

183 Each of these scenarios is based on analysis from previous MGI research. For further details, see *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute, November 2011.

estimates in the climate response case is driven by two factors.[184] First, we assumed that lower demand in this case eliminates the supply-chain stress in the supply expansion scenario, which reduces the overall upstream investment. Second, we used McKinsey's 2020 oil supply curve to estimate the impact of lower demand in the climate response case on overall capital costs. The marginal well in the climate response scenario is less costly than the marginal well in the supply expansion, and we estimate that this could reduce the average capital requirement per barrel by up to 30 percent. While the IEA mentioned this supply-curve effect in its 2010 World Energy Outlook, its impact does not appear to be calculated to the same magnitude as in our estimates, if at all.

MINERALS

Estimates of minerals capital requirements come from a variety of sources, including IHS Global Insight for historical capital expenditure and the McKinsey Basic Materials Institute models for future estimates. Within mining, we included costs such as mining leases, land, processing plants, deforestation, and other environmental restoration charges and infrastructure. We utilized McKinsey Basic Materials Institute supply models to directly estimate capital expenditure related to the mining of iron ore, coal and copper extraction. Investment in the extraction of these three minerals in 2013 represents approximately 50 percent of extraction expenditure for the mining sector as a whole. For thermal coal, we included a “climate response” scenario (similar to the oil and gas case), where we assumed changes in the primary energy mix away from thermal coal toward more renewables, in order to reach a 450-ppm pathway. The reduction in investment was applied to the “growth” capital expenditure estimates. We assumed that investment in other minerals is maintained at a similar ratio to current investment shares (roughly 50 percent) in order to estimate investment in these other mineral resources to 2030.

Our estimates for mining investment are in line with industry estimates. Citigroup estimates that by 2020 there could be $500 billion of greenfield investments, which corresponds closely to our cumulative 2020 estimate of roughly $600 billion by the same year.[185] The differences could be explained by the fact that the Citigroup estimates consider only future projects that have already been announced, without accounting for the undisclosed ones that will potentially come online. Our estimates are also in line with a well-known industry rule of thumb that suggests that capital expenditure should always be around 10 percent of mining revenue. In 2020, McKinsey’s Basic Materials Institute estimates that mining revenue could be roughly $2,200 billion, which suggests a capital expenditure very close to our estimate of $230 billion in the same year.

184 For comparison purposes, we have excluded IEA estimates of capital investment in LNG infrastructure, gas transmission and distribution infrastructure, and inter-regional transport for oil, as we do not estimate these costs in our analysis. These investments are roughly $100 billion per annum in World Economic Outlook 2010 and 2011.

185 *Generation next: A look at future greenfield growth projects*, Citigroup Global Markets, June 2011.

To estimate the geographical split of this investment (for minerals and oil and gas), we considered the following three scenarios:

- **Base case.** This estimate is based on analysis by McKinsey Basic Materials Institute and McKinsey Energy Insights. Roughly 11 percent of future capital investment is estimated to be in low-income and lower-middle-income countries to 2030.

- **Announced projects.** Based on a database of announced projects (from IHS Herold for energy and Metals Economics Group for minerals), the share of growth capital investment to 2030 in low-income and lower-middle-income countries would be 20 percent (16 percent if growth and maintenance capital investment are included).

- **Investment per square kilometer.** This is based on an assumption that we see an equalization of investment per square kilometer across countries. OPEC countries are removed from the sample in order to provide a more conservative (but realistic) estimate. Using this methodology, roughly 22 percent of growth capital investment would be in low-income and lower-middle-income countries (18 percent if growth and maintenance capital investment are included).

We decided not to base future investment flows in different geographies on share of estimated reserves due to concerns about the reliability of reserves data.

4. Sizing of 2030 poverty impact

We estimated the potential poverty impact for resource-driven countries by using historical benchmarks of poverty improvement. First, we analyzed the number of people in extreme poverty in resource-driven countries today. We applied the metric most often used for extreme poverty, defined as people living on less than $1.25 a day, PPP-adjusted. Using this definition, we retrieved 2010 data on poverty rates from PovcalNet, the online tool for poverty measurement developed by the Development Research Group of the World Bank on a country-level basis. This data set covers data for all developing economies, although not all were listed on an individual basis. For countries not specifically listed in this data set, we used regional averages for their poverty rates. We applied the poverty rates to the population numbers listed in the same source to calculate the absolute number in poverty in resource-driven countries.

Second, we examined the performance of our list of resource-driven countries in terms of the reduction in their poverty rates, in percentage points, between 1990 and 2010. We then chose high performers from this list as a demonstration of what the high end for poverty reduction could be in the future. Because strong performance in this category was dependent on the starting level of poverty, we categorized the countries into four segments. Those four segments were countries with a 1990 poverty level between 0 and 20 percent (for example, Brazil); 20 and 40 percent (for example, Botswana); 40 and 60 percent (for example, Indonesia); and 60 and 100 percent (for example, Vietnam). The fourth segment was a larger band than the rest of the segments because the number of countries in the higher poverty ranges was limited. We then averaged the annual

poverty reduction, in percentage point terms, for the three highest performers in each segment as a measure of what strong performance looks like for each starting level of poverty.

Third, for our forward projection of potential, we categorized the resource-driven countries that still had a population under the $1.25 line into the four categories, based on their 2010 poverty rates, and applied the strong poverty reduction performance levels for the next 20 years. This provided us with poverty rates for 2030 for each resource-driven country. To address discrepancies between the World Bank's population data (Population Estimates and Forecasts) and PovcalNet, we estimated future population by applying the 2010–2030 growth rates in the former source to the 2010 population levels listed in the latter. We then applied the projected poverty rates to these population numbers to create a 2030 poverty number.

There are several caveats with this analysis. First, for some countries in our sample, up-to-date poverty data are not available, and the World Bank makes the assumption that any country with no survey data has the same poverty rate as the average for its region. In some countries where poverty data are available, they may be based on surveys that are somewhat dated. Second, the quality of these household surveys varies significantly due to local circumstances. In some cases, such as in India, the reported income estimates appear to be meaningfully lower than those implied by macroeconomic data. Third, the purchasing power parity estimates used in the construction of the income and poverty estimates face certain methodological challenges, such as the difficulty of estimating single price levels for entire countries. Given these concerns and the issues with identifying appropriate benchmarks, we stress that the poverty analyses are used only to serve as a thought experiment regarding the range of the potential impact on global poverty, rather than as a forecasting exercise.

5. The Resource Value Chain Country Index

We identified the ten best-performing countries in each of the six key areas highlighted in this report. An assessment across each of these areas is made difficult due to a lack of specific and comprehensive resources sector data, but we have used the best available data for each of the six elements (Exhibit A3).

Our aim was to choose those metrics that focused on end outcomes (rather than inputs or processes), were robust (for example, preference for quantitative rather than qualitative assessments where possible), covered a wide range of countries, and were specific to the resources sector. Finding metrics that met all these criteria was not always possible. However, based on our consultations with industry experts, we believe that the metrics chosen give an informative view of country performance. While we believe the index to be directionally correct, we recognize that there is considerable scope to expand research in this area in order to develop a more robust and targeted set of performance metrics. Our aim is to work with others to build such a data set in the future.

We indexed the metrics on a scale of zero to 1, with the best performing country at 1 and the worst at zero. In several areas, we aggregated numerous metrics, sometimes at many levels. Once we had done this, we re-indexed the metrics on the same basis at each stage of aggregation.

Exhibit A3
Resource Value Chain Country Index—metrics

	Metric	Source	Rationale
Institutions and governance	Property rights	WEF[1] Competitiveness Index	Represents overall regulatory regime
	Business impact of rules on FDI	WEF Competitiveness Index	
	Control of corruption	World Bank WGI[2]	
	Availability of exploration data	Revenue Watch RGI[3]	Represents strength of competitive pressure
	Independence, reporting, and checks of licensing process	Revenue Watch RGI	
	Governance of state-owned companies	Revenue Watch RGI	
	Ability to attract talent	WEF Competitiveness Index	Proxy for government access to talent
	Ability to retain talent	WEF Competitiveness Index	
Infrastructure	Quality of railroads	WEF Competitiveness Index	Difficult to find any specific metrics on infrastructure sharing—so broader measures of performance
	Quality of port infrastructure	WEF Competitiveness Index	
	Quality of electricity supply	WEF Competitiveness Index	
Fiscal policy and competitiveness	Regulatory duplication and inconsistencies as a deterrent to investment	Fraser Institute[4]	Two key areas where government can intervene to reduce cost base
	Supply of labor/skills as a deterrent to investments	Fraser Institute[4]	
	Taxation as a deterrent to investment	Fraser Institute[4]	Tax levels are critical area of competitiveness
	Country risk ratings	Morningstar	Reflects country risk
Local content	Quality of local supplier base	WEF Competitiveness Index	Represents development of local supplies
Spending the windfall	Openness of government budget	International Budget Partnership	Represents quality of budgetary process
	Checks on budgetary process	Revenue Watch RGI	
	Adjusted net savings (modified)	World Bank	Represents overall level of saving
	Government effectiveness	World Bank WGI	Proxies for overall effectiveness of delivery
	Public investment management index	International Monetary Fund	
Economic development	McKinsey Global Institute economic performance score	McKinsey Global Institute economic database	Based on past MGI experience on economic performance

1 World Economic Forum.
2 Worldwide Governance Indicators.
3 Resource Governance Index.
4 Assessment for mining sectors only (limited by Fraser Institute data availability).
SOURCE: McKinsey Global Institute analysis

INSTITUTIONS AND GOVERNANCE

For institutions and governance of the resources sector, we used metrics that would effectively demonstrate performance in three areas that our research identified as important: having a regulatory environment that is stable and conducive to investment; making sure the system is designed to encourage competitive pressure; and ensuring that government regulators and state-owned companies have access to talent. We gave the regulatory environment category twice the weight of each of the others because of its overriding importance. We discuss the three areas below:

- **Regulatory environment.** We aggregated three metrics covering important aspects of the regulatory system. The first was the results of a survey question from the World Economic Forum's Global Competitiveness Report: "How strong is the protection of property rights in your country?" The second was the question, from the same survey, "In your country, to what extent do rules and regulations encourage or discourage foreign direct investment?" The third was the control of corruption assessment from the World Bank's Worldwide Governance Indicators. We gave the three aspects equal weight.

- **Competitive pressure.** We aggregated data from three sub-categories, all drawing on Revenue Watch's Resource Governance Indicators. The first was a rating of reporting practices on exploration data. The second was a rating of the licensing process, which itself is an aggregation of three other ratings: the independence of the licensing process, reporting on the licensing process, and checks on the licensing process. The third was a rating of the governance of state-owned companies that we aggregated from nine Revenue Watch metrics: comprehensive reports, production data, revenue data, quasi-fiscal activities, board of directors, quality of reports, reports audited, use of international accounting standards, and disclosure of conflicts of interest.

- **Access to talent.** There were no data that exclusively covered either the public sector or the resources sector. Therefore, as a proxy we used an aggregate of the response to two questions on countries' overall ability to access talent from the World Economic Forum's Global Competitiveness Index: "Does your country retain talented people?" and "Does your country attract talented people from abroad?"

We also considered various metrics on the issue of political stability and the rule of law, including those from the World Bank's Worldwide Governance Indicators, but decided against including them because of the potential overlap with the metrics used in the competitiveness metric.

INFRASTRUCTURE

After a comprehensive search for metrics that could be used for a proxy of infrastructure sharing, we determined that none was available that met our stipulated criteria. Instead we used survey data from the World Economic Forum's Global Competitiveness Report on the quality of the types of infrastructure particularly relevant for extractive companies. For the question "In your country, how would you assess the following aspects of transport infrastructure?" we used the results for railroad system and seaport facilities. We also used the responses to the question "In your country, how would you assess the reliability of the electricity supply?" We gave equal weight to all three elements. We also considered using an additional question on the road network but decided

against this on the following grounds: the quality of roads varies greatly within a country, and survey respondents are often more aware of roads in the center of cities. We therefore felt that the data did not accurately reflect the experience of extractive companies.

COMPETITIVENESS

For this segment, we examined three areas: business costs that governments can control, the taxation regime, and the level of country risk. We gave these three equal weight. For business costs, we used the results from two aspects of a Fraser Institute survey (which focuses on the mining sector)—regulatory duplication and inconsistencies, and the availability of labor and skills. We also used the Fraser Institute responses on taxation. The Fraser Institute survey responses are presented as the percentage of respondents providing a score from 1 to 5, with 1 denoting that the issue encouraged investment and 3 to 5 discouraging investment to varying degrees. For each question, we collated these responses into a single score for each country by applying a linear weighting and multiplying the numbers responding for each score. For the level of country risk, we used credit rating risk data from Morningstar.

LOCAL CONTENT

Here we used data from the World Economic Forum's Global Competitiveness Report on the question "In your country, how would you assess the quality of local suppliers?" We also considered various metrics on the share of expenditure in the resources sector focused on local goods and services; however, this had a number of complications. First, there is a lack of common understanding of what constitutes "local" content, or a "local" supplier.[186] Second, there is a lack of cross-country data based on a common definition of local content. Finally, it is not necessarily the case that a higher share of local procurement is an indicator of better performance. For example, in some cases, regulatory requirements for high shares of local procurement may result in significant cost inflation, threatening the competitiveness of the resources sector.

SPENDING THE WINDFALL

In this segment, we examined three areas and gave them equal weight: the budget process, the level of overall saving in the economy, and the effectiveness of delivery of funds. For budgeting, we gave equal weight to two metrics: the Open Budget Index, from the International Budget Partnership, and the assessment of checks on the budgetary process from Revenue Watch's Resource Governance Indicators. For saving, we modified data from the IMF's Adjusted Net Savings to calculate a version of net savings plus education investment minus resource and forest depletion. For delivery, we combined data from the IMF's Public Investment Management Index with the World Bank's Worldwide Governance Indicator for government effectiveness, giving them equal weight. We also considered data on fiscal sustainability rules, but those that we examined excluded rules relating to resources revenue. Moreover, because the focus of these data was on the number of rules rather than their strength, for our purposes they gave a misleading picture. We also looked for data on the quality of fund management and the effectiveness of countries in managing local stakeholder expectations but could not find an effective comparison measure between countries.

186 For further discussion on this point, see *Increasing local procurement by the mining industry in West Africa*, World Bank, January 2012.

ECONOMIC DEVELOPMENT

Here we used MGI's economic performance scorecard, described elsewhere in this appendix.

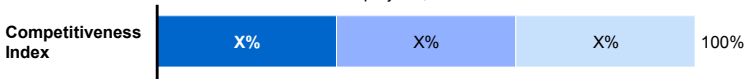
6. The Resource Competitiveness Index

In Chapter 2, we introduced the Resource Competitiveness Index, which takes a broader view of competitiveness using real project economics. It comprises three major elements that define country competitiveness: production costs, country risk, and government take, calculated as a percentage of revenue. The length of each bar in Exhibit A4 represents the proportion of revenue dedicated to each of these.

Exhibit A4

We have quantified the three elements of competitiveness as a percentage of revenue, adding them into a Competitiveness Index

- Each element of competitiveness is quantified as a % of revenue
- The length of the overall bar indicates overall competitiveness: a shorter bar denotes a more competitive country
- Forecast data from real projects, 2013–40



	Production costs	Country risk	Government take	Free cash flow and other costs
Included	▪ Capital expenditure ▪ Operational expenditure ▪ Logistics and transport	▪ Country risk rate (derived from national borrowing costs) ▪ Value at risk (in terms of free cash flow)	▪ Royalties ▪ Taxes ▪ State equity (oil and gas analysis only)	(not shown in index; not an element of competitiveness) ▪ Greenfield exploration costs ▪ Non-mine site costs (e.g., headquarters, financing costs) ▪ Profits for the company
Source	▪ Wood Mackenzie ▪ McKinsey Cost Curves	▪ Morningstar ▪ McKinsey Global Institute analysis	▪ Wood Mackenzie ▪ McKinsey Cost Curves	

SOURCE: McKinsey Global Institute analysis

The data for each component were calculated as follows:

PRODUCTION COSTS

The figures for production cost represent capital and operating costs for all assets in the country, aggregated for each year from 2013 to 2040. Capital expenditure includes both the initial and the sustaining elements. Operational expenditure includes mine site and asset level costs. It does not include administrative costs or exploration expenditure. The total aggregated figures per country per year are discounted to 2013 at a 10 percent rate (used as a proxy for the standard private-sector discount rate before considering country risk factors) and then divided over discounted revenue to obtain a percentage. Oil and gas and copper production costs were sourced form Wood Mackenzie, a specialist in extractive industry data sets. In total, we have data for 15 oil- and gas-producing countries and 23 copper-producing countries. Any countries with fewer than three assets, whether planned or existing, are excluded from the final results. This led to excluding two oil and gas countries and seven copper countries.

COUNTRY RISK

The country risk is composed of the proportion of revenue at risk and the probability of losing it. To reflect this, our methodology considers two factors that affect the length of the risk bar of a country: the adjusted country risk rating (based on Morningstar's sovereign default risk) and the "free cash flow and other costs" amount. The larger this amount, the larger the risk bar, as these are the future flows at risk. The country risk is calculated by discounting the "free cash flow and other costs" amount twice: once at a 10 percent rate and once at the adjusted country risk rating for that country. The latter net present value (NPV) is then subtracted from the former and divided over the NPV of revenue at a 10 percent discount rate. This results in a measure of risk as a percentage of revenue. The adjusted country risk rating is based on the sovereign default risk obtained from Morningstar. This yields results between 9.3 percent (Norway) and 33.8 percent (Afghanistan). We made an adjustment to this set of data to reflect risk magnitudes relevant to project risk. We normalized the adjusted country risk rating to a range of between 10 percent for Norway (our base discount rate and very close to the lowest actual value) and 15 percent for Afghanistan (which we assumed is the maximum risk of zero returns faced by extractive companies).

GOVERNMENT TAKE

Data on the government take for oil and gas were also obtained from Wood Mackenzie. For copper, the government take estimates are based on McKinsey analysis for a midsize, midgrade copper mine and the relevant government tax rate.[187] The government take estimates include state carry (that is, revenue or profits accrued to the state as part of a production-sharing agreement), royalties, and income taxes. The copper index incorporates the regular fiscal system and any additional royalties.

7. Estimating infrastructure requirements in resource-driven countries

MGI has previously estimated that the 84 countries that account for over 90 percent of world GDP will need to invest between $57 trillion and $67 trillion in infrastructure between 2013 and 2030 in order to maintain economic growth.[188] Three methodologies were used to arrive at this estimate: analyzing historical spending; identifying trends in the stock of infrastructure using a perpetual inventory model; and surveying external projections from the OECD, the IEA, and Global Water Intelligence.

We have extended this estimate in two ways. First, we have broadened coverage of this estimate by extrapolating the result to all resource-driven countries (only 36 percent were covered in the original sample). To do this, we assume that the countries not covered in the original research will have a similar infrastructure-

187 Sources for effective tax rates: *Preliminary analysis of taxes on a representative copper mine investment in Peru and Chile*, Ernst & Young, 2011; *Corporate income taxes, mining royalties and other mining taxes*, PricewaterhouseCoopers, June 2012; SUNAT (Superintendencia Nacional de Aduanas y de Administración Tributaria), Peru.

188 *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute and the McKinsey Infrastructure Practice, January 2013.

spending–to–GDP ratio as the sample for which data are available (in this case 4.2 percent of GDP). All data required were sourced from the MGI Economic Database. Since the previous MGI numbers do not include an estimate of pipeline infrastructure, we estimated total spending on oil and natural gas pipeline infrastructure using data on the total length of crude and natural gas pipelines that were built in the past and estimating the need for additional future pipeline infrastructure based on projected incremental production of crude and natural gas. These estimates were added to the overall MGI numbers.

Second, we have estimated the share of total infrastructure spending accounted for by the resources sector. We started from our estimates of growth and maintenance investment in extraction between 2013 and 2030, calculated using models from the McKinsey Basic Materials Institute, McKinsey Energy Insights, and oil and gas data from Wood Mackenzie. We then determined the share of capital expenditure in resource-driven countries using data on current and future supply of oil and gas as well as minerals. For example, we used the supply of iron ore as a proxy for bulk materials and copper supply for base metals.

We then broke down this capital expenditure to estimate the share related to infrastructure. For oil and gas, we draw on a combination of expert interviews and data on capital spending on facilities from the Rystad DCube database. Rystad estimates that spending on facilities worldwide comprises around 38 percent of overall capital expenditure in oil and gas; our expert interviews suggested 15 percent of this would be related to transport and power infrastructure. In addition, we also estimated the cost of all crude and gas pipeline construction, drawing on estimates of additional pipeline requirements and projected construction costs. For mining projects, we reviewed the preliminary economic assessments of 17 mining projects to break down their projected capital expenditure into infrastructure and non-infrastructure spending.[189] The categories of infrastructure spending considered were power (transmission lines, transformers, generation equipment); water (including freshwater pumping, pipelines, and sewage management but excluding tailing dams and process water); roads (access roads and bridges, but not roads wholly within the concession whenever possible); rail (including tracks and loading facilities but excluding rolling stock); and ports (including terminals and dredging).

189 These technical reports are made public by all Canadian-listed mining companies under National Instrument 43–101. Many junior mining companies are headquartered in Canada, so there are filings for projects around the world.

8. Economic Development Assessment Tool

MGI has developed a new framework for assessing the contribution of extractive companies to local development across six dimensions: fiscal contribution; job creation and skill building; infrastructure investment; social and community benefits; environmental preservation; and stakeholder communication. More than 90 indicators are used to assess performance in these six dimensions. The indicators were developed based on an extensive literature review as well as the input of McKinsey and external experts and extractive company representatives.

This tool, unlike others in this area, focuses on the asset level (for example, a particular coal project in a given country) rather than at the group level. We believe this better reflects the local realities "on the ground," where the most critical stakeholder interactions take place.

The performance assessment consists of a management survey and a detailed evaluation that includes stakeholder interviews, as described below:

- **Management survey.** An online survey was completed by a range of company executives at the asset to identify company priorities on local development across the six dimensions; self-assess performance on the different dimensions at the asset level; and take the perspective of local stakeholders to assess company performance. It aims to provide an initial fact base to test actual performance and alignment between local stakeholder and company priorities.

- **Detailed assessment.** A detailed assessment on over 90 metrics is completed by a McKinsey team. It involves a series of in-depth interviews with local stakeholders and company representatives. It provides an independent assessment of company performance on the different dimensions of local development, and takes a more granular look at local stakeholder perceptions.

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